SURFEX User Guide

V9.0.0

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1 How to install the software

Reference to subsection 2.2.1 of the scientific documentation.

1.1 Basic packages to install on a linux PC

To run SURFEX, several packages need to be installed on a Linux PC:

- shell KSH
- a fortran compiler (if none is ever installed, choose gfortran+gcc)
- C++

Before to install SURFEX, please verify these packages are present on your computer.
Optional:

- MPI library (OPENMPI or MPICH2)

If MPI is not installed, SURFEX needs to be compiled with VER_MPI=NOMPI.
In that case, type *export VER_MPI="NOMPI"* before running the configure file.

1.2 Export off-line version of SURFEX

First important recommandation: before to run an experiment (pgd, prep or offline), you need to type: export OMP_NUM_THREADS=1 in the terminal where you will run the experiment. It's even better to put this line in your file $HOME/.bash_profile so that it's executed each time you open a new terminal.

Instructions to install surfex on a linux-PC and to run a 1d example.

1. **select a directory** where installation has to be done: for example $HOME or $HOME/MYDIR, where MYDIR is an existing directory (if not, it has to be created by the user). From now on, it is supposed that the user has defined a MYDIR directory.

   Caution: the directory and all parent directories MUST NOT contain dots (.) in their names.

2. **download the package** and move it into $HOME/MYDIR/open_surfex_v9_0_0.tar.gz (You can also get the package from GIT directly).

3. **extract files from archive**: tar zxvf open_surfex_v9_0_0.tar.gz (or gunzip open_surfex_v9_0_0.tar.gz and then tar xvf open_surfex_v9_0_0.tar.gz). A directory open_SURFEX_V9_0_0/ is created in MYDIR and contains all software peaces.

4. **initialize environment variables needed for surfex**: go into src directory and run **./configure**. Then, execute the profile file for this master version of surfex:
   . ../conf/profile_surfex-LXgfortran-SFX-V9-0-0-MPIAUTO-O2

5. **compile the master version of the code**: in the src directory, run **make**, and then **make installmaster**. Master executables are created in directory **exe**. If everything goes well until this step, then master surfex has been successfully installed on you computer.

6. **how to compile your own source code**:

   (a) choose a name for your own source directory in src, for example MYSRC. Copy the sources (from OFFLIN or SURFEX directories) that you want to modify onto $SRC_SURFEX/src/MYSRC

   (b) go to $SRC_SURFEX/src/MYSRC and make your modifications

(c) go to $SRC_SURFEX/src and launch successively
export VER_USER=MYSRC
./configure
. ../conf/profile_surfex-LXgfortran-SFX-V9-0-0-MYSRC-MPIAUTO-O2
make user and make installuser.
New executable files for MYSRC will be created in exe directory.

2 Overview of the externalized surface sequence

The externalized surface facilities do not contain only the program to run the physical surface schemes, but also those producing the initial surface fields (before the run) and the diagnostics (during or after the run). All these facilities are listed, below, and they separate in 4 main parts:

1. PGD (routine pgd_surf_atm.f90): this program computes the physiographic data file (called PGD file below). At this step, you perform 3 main tasks:

   (a) You choose the surface schemes you will use.

   (b) You choose and define the grid for the surface

   (c) The physiographic fields are defined on this grid.

   Therefore, the PGD file contains the spatial characteristics of the surface and all the physiographic data necessary to run the interactive surface schemes for vegetation and town.

2. PREP (routine prep_surf_atm_n.f90): this program performs the initialization of the surface scheme prognostic variables, as temperatures profiles, water and ice soil contents, interception reservoirs, snow reservoirs.

3. run of the schemes (routine coupling_surf_atm_n.f90): this performs the physical evolution of the surface schemes. It is necessary that this part, contrary to the 2 previous ones, is to be coupled within an atmospheric forcing (provided either in off-line mode or via a coupling with an atmospheric model).

4. DIAG (routine diag_surf_atm_n.f90): this computes diagnostics linked to the surface (e.g. surface energy balance terms, variables at 2m of height, etc...). It can be used either during the run (adding these diagnostics in the output file(s) of the run), or independantly from the run, for a given surface state (still, an instantaneous atmospheric forcing is necessary for this evaluation).

In addition, in order to read or write the prognostic variables or the diagnostics variables, respectively, in the surface files, the following subroutines are used: init_surf_atm_n.f90, write_surf_atm_n.f90 and write_diag_surf_atm_n.f90.

2.1 Using SURFEX in offline mode

2.1.1 Namelist NAM_IO_OFFLINE

This namelist is the main namelist used in the off-line mode. It gives the name, type, values, default value as they exist in the SURFEX code. The last column of the table gives the cross-reference with the scientific documentation (when relevant).

Name	Type	Values	Default	X-Reference
CSURF_FILETYPE	character(LEN=6)	"FA", "ASCII", "LFI","NC"	"ASCII"	
CTIMESERIES_FILETYPE	character(LEN=6)	"NETCDF", "OFFLIN", "NONE", "ASCII", "TEXTE", "BINARY","FA", "LFI", "NC", "XIOS"	"NONE"	
CFORCING_FILETYPE	character(LEN=6)	"NETCDF", "BINARY", "ASCII"	"NETCDF"	
CPGDFILE	character(LEN=28)		"PGD"	
CPREPFILE	character(LEN=28)		"PREP"	
CSURFFILE	character(LEN=28)		"SURFOUT"	
LRESTART_2M	logical		F	
LPRINT	logical		F	
LRESTART	logical		F	
LINQUIRE	logical		F	
NSCAL	integer	≤ 59	0	
NHALO	integer		0	
XTSTEP_SURF	real		300.	
XTSTEP_OUTPUT	real		1800.	
LDIAG_FA_NOCOMPACT	logical		F	
LSET_FORC_ZS	logical		F	
LWRITE_COORD	logical		F	
LWRITE_TOPO	logical		F	
LOUT_FILENAME	logical		F	
LLIMIT_QAIR	logical		F	
LSHADOWS_SLOPE	logical		F	
LSHADOWS_OTHER	logical		F	
NB_READ_FORC	integer		0	
NPROMA	integer		/	
NI	integer		/	
NJ	integer		/	
XIO_FRAC	real		1.	
YALG_MPI	character(LEN=4)	"LIN ","ADJ ","TILL", "TILA"	"LIN"	
XDELTA_OROG	real		200.	
LADAPT_SW	logical		F	
CINTERP_SW	character(LEN=3)	"ZEN","LIN","OLD"	"LIN"	
LFAGMAP	logical		F	
LALLOW_ADD_DIM	logical		F	
LDELAYEDSTART_NC	logical		F	
NDATESTOP	integer(4)		0000	
CSPECSNOW	logical		F	
LFORCIMP	logical		F	
NIMPUROF	integer	0,1,2	0	
LFORCATMOTARTES	logical		F	
LGRID_MODE	logical		F	
LNEW_TIME_INTERP_ATM	logical		F	
CTIME_INTERP_PRCP	character(LEN=3)	'OLD','DEF','PDF'	'DEF'	

- CSURF_FILETYPE: type of Surfex surface files created during PGD or PREP steps.
- CTIMESERIES_FILETYPE: type of the files containing the output diagnostic time series.
- CFORCING_FILETYPE: type of atmospheric forcing files.
- CPGDFILE: name of the PGD file.
- CPREPFILE: name of the PREP file.
- CSURFFILE: name of the final output surfex file (restart file).
- LRESTART_2M: if T, N2M=1 in NAM_DIAG_SURFn and LPGD=T in NAM_ISBA for the writing of the restart file.

- LPRINT: write information on screen during run.
- LRESTART: write restart file.
- LINQUIRE: enable test of inquiry mode.
- NSCAL: to run a test case for the chemical part. NSCAL can take values until 59.
- NHALO: size of the halo for interpolations in PGD step (INTERPOL_FIELD). NHALO = 0 means that the whole domain is considered.
- XTSTEP_SURF: surface time step .
- XTSTEP_OUTPUT: time step of the output time series .
- LDIAG_FA_NOCOMPACT: fa compaction for diagnostic files.
- LSET_FORC_ZS: if T, the orography of the forcing file is set to the same value as in surface file.
- LWRITE_COORD: enables write of fields XLAT and XLON in output file .
- LWRITE_TOPO: If true, write metadata ZS, aspect, slope in the output file (+ variable massif_num or station if present in the forcing file)
- LOUT_TIMENAME: change name of output file at the end of the day .
- LLIMIT_QAIR: General flag for coherence between forcing Qair and calculated Qsat(Tair).
- LSHADOWS_SLOPE: flag to account for shadows of the slope itself. Works only on a rectangular domain, with XIO_FRAC=1., YALG_MPI='LIN', and LEXPLICIT_SLOPE=T in NAM_ZS.
- LSHADOWS_OTHER: flag to account for shadows of the surrounding mountains. Works only on a rectangular domain, with XIO_FRAC=1., YALG_MPI='LIN', and LEXPLICIT_SLOPE=T in NAM_ZS.
- NB_READ_FORC: subdivisions of the reading of forcings. Can vary from 1 (all forcing data read in one time) to the total number of forcing time steps (what was done until now). It's usefull especially for netcdf forcing files on HPC.
- NPROMA, NI, NJ: parameters needed for OPEN-MP offline driver from GMAP, but not used in classical offline mode (size of openMP packets, domain sizes).
- XIO_FRAC: the I/O processor/thread will be affected XIO_FRAC * number of points affected to other processors/threads.
- YALG_MPI: type of algorithm used to distribute points in case of MPI parallelization:
  - LIN: linear distribution
  - ADJ: distribution grouping geographically adjacent points
  - TILL: distribution to balance points from same tiles and types of vegetation between processors.
  - TILA: distribution that combines ADJ and TILL.
- XDELTA_OROG: maximum difference allowed between forcing and surface file orographies if LSET_FORC_ZS=.F. (m) used in classical offline mode (size of openMP packets, domain sizes)
- LADAPT_SW: to activate the simple coherence between solar zenithal angle and radiation coded for TEB. The default is FALSE because this coherence should be computed more realistically.
- CINTERP_SW: method to temporal interpolation of SW forcing. The following options are currently available (replaces old key LINTERP_SW) :

  - ZEN: new interpolation using theorical zenithal angle dependancy
  - LIN: linear temporal interpolation of SW forcing (method used before when LINTERP_SW=F)
  - OLD: interpolation using simple zenithal angle dependancy (method used before when LINTERP_SW=TRUE)

- LFAGMAP: if TRUE, activate output files in GMAP FA format.
- LALLOW_ADD_DIM: to be used only with XIOS. Allows to write TG, WG, WGI, SWD_ISBA/TEB/SEAFLUX/WATFLUX/FLAKE/SURF_ATM, SWU_ISBA/TEB/SEAFLUX/WATFLUX/FLAKE/SURF_ATM in 2D (number of points / number of ground layers for TG, WG, WGI; number of points / number of spectral bands for SWD and SWU).
- LDELAYEDSTART_NC: to begin the simulation from the PREP date, picking the corresponding forcing time step in the NETCDF forcing file.
- NDATESTOP: to end the simulation at this date (/year, month, day, hour/), also in case of a NETCDF forcing file. hour is expressed in seconds.
- CSPECSNOW: Enable spectral computation inside SURFEX/Crocus, necessary to run TARTES model.
- LFORCIMP: If True, impurities are prescribed in the forcing file in variables IMPWET1, IMPDRY1, IMPWET2, IMPDRY2, etc.
- NIMPUROF: Initialize the number of impurities in the OFFLINE module, you have to set NIMPUROF to the same value as NIMPUR (in the namelist NAM_PREP_ISBA_SNOW).
- LFORCATMOTARTES: autorize forcing of total aerosol optical depth and ozone column
- LGRID_MODE: if activated, declare fields for xios with a grid rather than a domain
- LNEW_TIME_INTERP_ATM: new forcing interpolation procedure. This option induces to have 2 additional time steps (t+1 and t+2) instead of 1 for averaged fluxes at the end of the forcing file (netcdf). No changes for instantaneous fields (Tair, Qair, Ps, etc.), which are interpolated linearly between time at t and t+1. For fluxes averaged for period ending at current time (typically longwave and shortwave radiations, wind, etc...), the flux is centred at mid interval using interpolation of forcing fluxes averaged from t-1 to t, t to t+1 and t+1 to t+2
- CTIME_INTERP_PRCP: if the new LNEW_TIME_INTERP_ATM is true, user can choose between 3 options to interpolate precipitation forcing
  - 'OLD': current value is applied during the entire time step without interpolation (as the historical default option)
  - 'DEF': the same method than for other fluxes are applied using interpolation of forcing precipitation averaged from t-1 to t, t to t+1 and t+1 to t+2.
  - 'PDF': A simple gaussian probability density function is used to disaggregate forcing precipitation from forcing time step to model time step. Can not be used for forcing time step $<$ 30min. This method is conservative.

2.1.2 Namelist NAM_LAND_USE

This namelist is needed when LLAND_USE = .TRUE. (NAM_IO_OFFLINE). The file referenced in this namelist has to be formatted as a Surfex PREP file and to contain at least 13 record: DIM_FULL, VEGTYPE_P1, ... VEGTYPE_P12. If CFTYP_VEGTYPE = 'OFFLIN', the file is a NETCDF file and its name needs to be PARAMS.nc.

Name	Type	Values	Default	X-Reference
CFNAM_VEGTYPE	character(LEN=28)			
CFTYP_VEGTYPE	character(LEN=6)	"FA", "ASCII", "LFI" "NC", "OFFLIN"		

2.1.3 Namelist NAM_ZS_FILTER

Filtering of the orography.

Name	Type	Values	Default	X-Reference
NOPTFILTER	integer		0	
NZSFILTER	integer		1	
RCOFILTER	real		1.0	
RTHFILTER	real		0.0	

- NOPTFILTER: Filtering option. If NOPTFILTER=1, new orographic filtering. If NOPTFILTER=0 (and RCOFILTER=1.0), orographic filtering is identical to before SURFEX V9.0.0
- NZSFILTER: number of iterations of the spatial filter applied to smooth the orography. 1 iteration removes the 2 Δx signal, 50% of the 4 Δx signal, 25% of the 6 Δx signal, etc.
- RCOFILTER: Filter efficiency coefficient
- RTHFILTER: Filtering threshold

2.1.4 Namelist NAM_NACVEG

Namelist used to define the keys for ISBA 2d-variational analysis.

Name	Type	Values	Default	X-Reference
NECHGU	integer		6	
RCLIMCA	real		0.	
RCLISST	real		0.05	
SIGH2M0	real		0.1	
SIGT2M0	real		1.0	
SIGWG0	real			
SIGWGB	real		0.06	
SIGW2B	real		0.03	
LOBSWG	logical			
LOBS2M	logical		F	
LIMVEG	logical		T	
SPRECIP2	real		4.0	
RTHR_QC	real		3.0	
SIGWG0_MAX	real		6.0	
RSCAL_JAC	real		4.0	
LPRINT	logical		T	
LAROME	logical		T	

2.2 Using SURFEX in Meso-NH

In this case, Meso-NH FM files are used. The parallelization of the surface fields is done during the reading or writing of the fields by the FMREAD and FMWRIT routines. Files are produced in LFI format. Since version 5.2, NETCDF format is also allowed in Meso-NH.

2.2.1 Initialization of surface fields integrated in Meso-NH programs

In Meso-NH, there are usually 2 ways to produce initial files, depending if you want to use real or ideal atmospheric conditions. However, from the surface point of view, there is no difference between these 2 main possibilities of fields (real -e.g. from operationnal surface scheme in an operationnal model- or

ideal -e.g. uniform-), whatever the treatment done for the atmospheric fields. This is allowed because the same externalized routines corresponding to PGD and PREP are used: In the case of realistic atmospheric fields, the Meso-NH programs calling the surface are:

1. PREP_PGD: it uses the PGD facility of the surface
2. PREP_NEST_PGD: surface fields are only read and rewritten, except the orography that is modified (the modification of the orography itself is considered as an atmospheric model routine, as orography is also a field of the atmospheric model).
3. PREP_REAL_CASE: it uses the PREP facility of the surface, that can produce either ideal or realistic surface fields.
4. SPAWNING: it does not produce surface fields any more. The surface fields will be recreated during the PREP_REAL_CASE step following the SPAWNING.

In the case of ideal atmospheric fields, the Meso-NH program calling the surface is
PREP_IDEAL_CASE: it uses both the PGD and PREP facilities of the surface. Ideal or realistic (the latter only in conformal projection) physiographic fields can be either produced or read from a file. Then the prognostic surface variables, either ideal or realistic, can be computed by PREP. If you use Meso-NH atmospheric model, the input and output surface files are the same as the atmospheric ones, so there is no need to specify via surface namelists any information about the input or output file names.

2.2.2 Namelist NAM_PGDFILE

Note however that, in PREP_PGD (just before the call to the surface physiographic computation in PGD, for which the namelists are described in the next chapter), there is a namelist to define the output physiographic file:

Name	Type	Values	Default	X-Reference
CPGDFILE	character(LEN=28)			
NHALO	integer		15	

3 The off-line guide

3.1 Input files

The use of the externalized surface software in off-line mode requires the preparation of several types of file, especially the input data necessary for the run and the definition of the options specified in the namelist.

- OPTIONS.nam is the namelist name used in the off-line model. The same namelist is used for the PGD, PREP and RUN facilities. The description of the different namelist blocks for PGD ("The physiographic fields") and PREP ("Initialization of the prognostic fields") tools are described in the next chapter. The namelist block where functionnalities of the off-line run in terms of Input/Output is named NAM_IO_OFFLINE.
- The principle of an off-line simulation is that the atmospheric variables are known in advance. Thus, time series of air temperature, humidity, wind speed, precipitation, pressure and radiation terms are known. These data are pre-treated in order to be written in specific files (see below) called forcing files. The preparation of the forcing files is the responsibility of the users.
- Like for any model, some parameters related to the scheme have to be set and state variable have to be initialized. These two tasks are performed by mean of tools PGD and PREP which lead to create the initial file used in the simulation.

3.2 Forcing files

3.2.1 Forcing format in ASCII/BINARY

There is:

- One ascii/binary file for each atmospheric variable
- One ascii configuration file named **Params_config.txt**.

The forcing variables and the associated file name(s) are the following (to run the model, the file names must be suffixed with ".txt" or ".bin" depending if the forcing data is prepared in ascii or binary mode:

- air temperature (K), Forc_TA
- air specific humidity (kg/kg), Forc_QA
- air pressure (Pa), Forc_PS
- rain rate (kg/m^2/s), Forc_RAIN
- snow rate (kg/m^2/s), Forc_SNOW
- wind speed (m/s), Forc_WIND
- wind direction (degrees from N, clockwise), Forc_DIR
- longwave radiation (W/m^2), Forc_LW
- direct shortwave radiation (W/m^2), Forc_DIR_SW
- diffuse shortwave radiation (W/m^2), Forc_SCA_SW
- near surface C02 concentration (kg/m^3), Forc_CO2

The *Forc_ ** files contain a line by forcing time step, and is composed of the values of the forcing parameters for each grid box of the simulated domain (defined in the PGD).
The *Params_ config.txt* file contains the following information:

- Y/N (only in binary case) to specify if the forcing data must be swapped
- number of points
- number of forcing time steps during the run
- forcing time step (seconds)
- year
- month
- day
- hour (seconds)
- longitude for each point of the domain (degrees)
- latitude for each point of the domain (degrees)
- altitude of each point of the domain (m)
- height of temperature forcing for each point of the domain (m)
- height of wind forcing for each point of the domain (m)

3.2.2 Forcing format in NetCDF

The atmospheric forcing is described by a single file: **FORCING.nc**. It's structure looks like:

- Dimensions
  - time
  - xx
  - yy
- Variables
  - time(time): units = "minutes since 1986-01-01 00:00:00" (example)
  - FORC_TIME_STEP :forcing time step (s)
  - LON(yy,xx): longitude (degrees)
  - LAT(yy,xx): latitude (degrees)
  - ZS(yy,xx): surface orography (m)
  - UREF(yy,xx): reference height for the wind (m)
  - ZREF(yy,xx): reference height for the temperature (m)

  - Tair(time,yy,xx): Atmospheric temperature (K)
  - Qair(time,yy,xx): Atmospheric humidity (kg/kg)
  - PSurf(time,yy,xx): Atmospheric pressure (Pa)
  - Rainf(time,yy,xx): Rain (kg/m^2/s)
  - Snowf(time,yy,xx): Snow (time,yy,xx) (kg/m^2/s)
  - Wind(time,yy,xx): Wind speed (m/s)
  - Wind_DIR(time,yy,xx): Wind direction (degrees from N, clockwise)
  - LWdown(time,yy,xx): Long-wave radiation (W/m^2)
  - DIR_SWdown(time,yy,xx): direct short-wave radiation (W/m^2)
  - SCA_SWdown(time,yy,xx): diffuse short-wave radiation (W/m^2)
  - CO2air(time,yy,xx): near surface CO2 concentration (kg/m^3)

3.2.3 Interpolation of forcing data at the model time step

Generally, the forcing time step is longer than the model time step.

That is why a linear interpolation is realized for nearly all atmospheric parameters, except for RAIN and SNOW that are set equal to the value at the end of the current forcing time step (that is the mean rate of rain during the spell between the two forcing time steps).

4 The physiographic fields

4.1 Choice of the surface scheme

4.1.1 Namelist NAM_PGD_SCHEMES

This namelist defines the four schemes that will be used, one for each type of surface (sea, inland water, town, vegetation).

Name	Type	Values	Default	X-Reference
CNATURE	character(LEN=6)	"NONE", "FLUX", "TSZ0","ISBA"	"ISBA"	
CSEA	character(LEN=6)	"NONE", "FLUX", "SEAFLX"	"SEAFLX"	
CWATER	character(LEN=6)	"NONE", "FLUX", "WATFLX", "FLAKE	"WATFLX"	
CTOWN	character(LEN=6)	"NONE", "FLUX", "TEB"	"TEB"	

- CNATURE: scheme used for vegegation and natural soil covers . The different possibilities are:
  - "NONE ": no scheme used. No fluxes will be cmputed at the surface.
  - "FLUX ": ideal fluxes are prescribed. The have to be set in the fortran routine init_ideal_flux.f90.
  - "TSZ0 ": In this cheme, the fluxes are computed according to the ISBA physics, but the surface characteristics (temperature, humidity, etc...) remain constant with time.
  - "ISBA ": this is the full ISBA scheme (Noilhan and Planton 1989), with all options developped since this initial paper.
- CSEA: scheme used for sea and ocean . The different possibilities are:
  - "NONE ": no scheme used. No fluxes will be cmputed at the surface.
  - "FLUX ": ideal fluxes are prescribed. The have to be set in the fortran routine init_ideal_flux.f90.
  - "SEAFLX": this is a relatively simple scheme, using the Charnock formula.
- CWATER: scheme used for inland water . The different possibilities are:
  - "NONE ": no scheme used. No fluxes will be cmputed at the surface.
  - "FLUX ": ideal fluxes are prescribed. The have to be set in the fortran routine init_ideal_flux.f90.
  - "WATFLX": this is a relatively simple scheme, using the Charnock formula.
  - "FLAKE ": this is lake scheme from Mironov, 2005.
- CTOWN: scheme used for towns . The different possibilities are:
  - "NONE ": no scheme used. No fluxes will be cmputed at the surface.
  - "FLUX ": ideal fluxes are prescribed. The have to be set in the fortran routine init_ideal_flux.f90.
  - "TEB ": this is the Town Energy Balance scheme (Masson 2000), with all the subsequent ameliorations of the scheme.
- LGARDEN: general flag to activate TEB_GARDEN

4.1.2 Namelist NAM_ISBA

Name	Type	Values	Default	X-Reference
NPATCH	integer	between 1 and 19	1	
NGROUND_LAYER	integer	>0	1E+9	
CISBA	character(LEN=3)	'2-L', '3-L', 'DIF'	'3-L'	
CPEDO_FUNCTION	character(LEN=4)	'CH78', 'C084' 'CH78'	'CH78'	
CPHOTO	character(LEN=3)	'NON', 'AST', 'NIT', 'NCB'	'NON'	
LTR_ML	logical	F		
CALBEDO	character(LEN=3)	'MEAN', 'DRY ', 'WET ','EVOL' 'CM13'	'DRY'	
XRM_PATCH	real	$> 0.$ and $< 1.$	0.	
XUNIF_CLAY	real	between 0 and 1	0.33	
YCLAY	character(LEN=28)			
YCLAYFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV', 'ASCLLV'	none	
XUNIF_SAND	real	between 0 and 1	0.33	
YSAND	character(LEN=28)			
YSANDFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV', 'ASCLLV'	none	
XUNIF_RUNOFFB	real	0.5		
YRUNOFFB	character(LEN=28)	' '	' '	
YRUNOFFBFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV', 'ASCLLV'	none	
XUNIF_WDRAIN	real	0.		
YWDRAIN	character(LEN=28)	' '		
YWDRAINFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV', 'ASCLLV'	none	
YCTI	character(LEN=28)			
YCTIFILETYPE	character(LEN=6)			
XUNIF_SOC_TOP	real	1.E+20		
XUNIF_SOC_SUB	real	1.E+20		
YSOC_TOP	character(LEN=28)	' '		
YSOC_SUB	character(LEN=28)	' '		
YSOCFILETYPE	character(LEN=6)			
XUNIF_PERM	real	1.E+20		
YPERM	character(LEN=28)	' '		
YPERMFILETYPE	character(LEN=28)	' '		
XUNIF_PH	real	1.E+20		
YPH	character(LEN=28)	' '		
YPHFILETYPE	character(LEN=28)	' '		
XUNIF_FERT	real	1.E+20		
YFERT	character(LEN=28)	' '		
YFERTFILETYPE	character(LEN=28)	' '		
LIMP_SAND	logical F			
LIMP_CLAY	logical F			
LIMP_CTI	logical F			
LIMP_SOC	logical F			
LIMP_PERM	logical F			
XSOILGRID	real(150)	1.E+20		
LMEB	logical		F	
LLULCC	logical		F	

- NPATCH: number of patches used in ISBA. One patch corresponds to aggregated parameters. 12 patches correspond to separate energy budgets for all vegetation types present in ISBA. 3 patches correspond to bare soil types, low vegetation, trees. If CPHOTO equals 'NON' any number of patches between 1 and 12 is possible, for the other values of CPHOTO, 12 patches are required. The order and the signification of each patch is the following:

  - 1: no vegetation (smooth) - NO
  - 2: no vegetation (rocks) - ROCK
  - 3: permanent snow and ice - SNOW
  - 4: temperate broadleaf cold-deciduous summergreen - TEBD (TREE)
  - 5: boreal needleleaf evergreen - BONE (CONI)
  - 6: tropical broadleaf evergreen - EVER
  - 7: C3 cultures types - C3
  - 8: C4 cultures types - C4
  - 9: irrigated crops - IRR
  - 10: grassland (C3) - GRAS
  - 11: tropical grassland (C4) - TROG
  - 12: peat bogs, parks and gardens (irrigated grass) - PARK
  - 13: tropical broadleaf deciduous - TRBD (TREE)
  - 14: temperate broadleaf evergreen - TEBE (TREE)
  - 15: temperate needleleaf evergreen - TENE (CONI)
  - 16: boreal broadleaf cold-deciduous summergreen - BOBD (TREE)
  - 17: boreal needleleaf cold-deciduous summergreen - BOND (CONI)
  - 18: boreal grass - BOGR (GRASS)
  - 19: shrub - SHRB (TREE)
- NGROUND_LAYER: number of soil layer used in case of diffusion physics in the soil (CISBA = 'DIF'):
  - with CISBA = 2-L, NGROUND_LAYER default is 2
  - with CISBA = 3-L, NGROUND_LAYER default is 3
  - with CISBA= DIF and LECOCLIMAP, NGROUND_LAYER default is 14
- CISBA: type of soil discretization and physics in ISBA:
  - '2-L': force-restore method with 2 layers for hydrology
  - '3-L': force-restore method with 3 layers for hydrology
  - 'DIF': diffusion layer, with any number of layers
- CPEDO_FUNCTION: Pedo-transfert function for DIF. The following options are currently available:
  - "CH78": Clapp and Hornberger 1978 for BC
  - "C084": Cosby et al. 1988 for BC
- CPHOTO:type of photosynthesis physics. The following options are currently available:
  - "NON": none is used. Jarvis formula is used for plant transpiration.
  - "AST": ISBA-AGS with offensive/defensive stress, without evolving Leaf Area Index
  - "NIT": ISBA-AGS with nitrogen, with evolving Leaf Area Index
  - "NCB": ISBA-AGS with nitrogen, with evolving Leaf Area Index and wood, soil, roots biomass
- LTR_ML: to activate new radiative transfert calculation, only if CPHOTO/=NON.
- CALBEDO: type of bare soil albedo. The following options are currently available:

  - "DRY ": dry bare soil albedo
  - "WET ": wet bare soil albedo
  - "MEAN": albedo for bare soil half wet, half dry
  - "EVOL": albedo of bare soil evolving with soil humidity
  - "CM13": albedo by cover and vegetation type processed from satellite data
- XRM_PATCH: threshol to remove little fractions of patches
- XUNIF_CLAY: uniform prescribed value of clay fraction.
- YCLAY: clay fraction data file name.
- YCLAYFILETYPE: type of clay data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_SAND: uniform prescribed value of sand fraction.
- YSAND: sand fraction data file name.
- YSANDFILETYPE: type of sand data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_RUNOFFB: uniform prescribed value of subgrid runoff coefficient.
- YRUNOFFB: subgrid runoff coefficient data file name.
- YRUNOFFBFILETYPE: type of subgrid runoff data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_WDRAIN: uniform prescribed value of subgrid drainage.
- YWDRAIN: subgrid drainage data file name.
- YWDRAINFILETYPE: type of subgrid drainage data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- YCTI: topographic indices file name.
- YCTIFILETYPE: type of topographic file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_SOC_TOP: uniform prescribed value of topsoil organic carbon (used only in CSOC=SGH in NAM_ISBAn)
- XUNIF_SOC_SUB: uniform prescribed value of subsoil organic carbon (used only in CSOC=SGH in NAM_ISBAn)
- YSOC_TOP: organic carbon topsoil data file name (used only in CSOC=SGH in NAM_ISBAn).
- YSOC_SUB: organic carbon subsoil data file name (used only in CSOC=SGH in NAM_ISBAn).
- YSOCFILETYPE: type of organic matter data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV') (used only in CSOC=SGH in NAM_ISBAn)
- XUNIF_PERM: uniform value of permafrost distribution (used only if CISBA=DIF)
- YPERM: file name for permafrost distribution (used only if CISBA=DIF)
- YPERMFILETYPE: permafrost distribution data file type('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV') (used only if CISBA=DIF)
- XUNIF_PH: uniform value of soil pH (used only if LCH_NO_FLUX=T)
- YPH: file name for soil pH (used only if LCH_NO_FLUX=T)

- YPHFILETYPE: soil pH data file type ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV') (used only if LCH_NO_FLUX=T)
- XUNIF_FERT: uniform value of soil fertilization rate (kgN/ha/h) (used only if LCH_NO_FLUX=T)
- YFERT: file name for soil fertilisation rate (kgN/ha/h) (used only if LCH_NO_FLUX=T)
- YFERTFILETYPE: soil fertilisation rate file type (kgN/ha/h)('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV') (used only if LCH_NO_FLUX=T)
- LIMP_SAND: reads sand fraction in an existing PGD file
- LIMP_CLAY: reads clay fraction in an existing PGD file
- LIMP_CTI: reads topographic indices in an existing PGD file
- LIMP_SOC: reads organic carbon in an existing PGD file
- LIMP_PERM: reads permafrost distribution in an existing PGD file
- XSOILGRID: uniform soil depth grid for CISBA=DIF. Default with CISBA=DIF and LECO-CLIMAP is (/0.01,0.04,0.10,0.20,0.40,0.60,0.80,1.00,1.50,2.00,3.00,5.00,8.00,12.0/)
- LMEB: Flag to activate MEB (please note that by default, MEB uses the TR_LM radiation scheme, so when LMEB=T, LTR_ML=T automatically)
- LLULCC: land-use land cover change scheme activation key

4.1.3 Namelist NAM_DATA_TSZ0

Treats TG and WG gradients as forcing variables. For that purpose, values of gradients at each time of a day are required and namelist NAM_DATA_TSZ0 should be filled.

Name	Type	Values	Default	X-Reference
NTIME	integer	1 ; 25	25	
XUNIF_DTS	real (NTIME)		-0.250	
XUNIF_DHUGRD	real		0.0	

- NTIME: number of subdivisions of a day to apply forcing gradients.
- XUNIF_DTS: values of temperature gradient for each time of a day
- XUNIF_DHUGRD: values of humidity gradient for each time of a day

4.1.4 Namelist NAM_DATA_SEAFLUX

Name	Type	Values	Default	X-Reference
LSST_DATA	logical	none	F	
NTIME_SST	integer	12	12	
XUNIF_SST	real			
CFNAM_SST	character(LEN=28)	' '		
CFTYP_SST	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	none	
NYEAR_SST	integer			
NMONTH_SST	integer			
NDAY_SST	integer			
XTIME_SST	real			

- LSST_DATA: flag to initialize SST from a climatology
- NTIME_SST: number of SST input files
- XUNIF_SST: prescribed uniform SST

- CFNAM_SST: SST data file name
- CFTYP_SST: type of SST data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- NYEAR_SST: year of SST data file
- NMONTH_SST: month of SST data file
- NDAY_SST: day of SST data file
- XTIME_SST: time in seconds of SST data file

How to initialise SST from external files: an example with 3 SST input files (lat, lon, value type).

```
&NAM_DATA_SEAFLUX
     NTIME_SST = 3 , LSST_DATA = T ,
     CFNAM_SST(1) = 'sst_1.dat', CFTYP_SST(1) = 'ASCLLV',
     CFNAM_SST(2) = 'sst_2.dat', CFTYP_SST(2) = 'ASCLLV',
     CFNAM_SST(3) = 'sst_3.dat', CFTYP_SST(3) = 'ASCLLV',
     NYEAR_SST(1)=1985, NMONTH_SST(1)=12, NDAY_SST(1)=31, XTIME_SST(1)=64800.,
     NYEAR_SST(2)=1986, NMONTH_SST(2)=1, NDAY_SST(2)=1, XTIME_SST(2)=43200.,
     NYEAR_SST(3)=1986, NMONTH_SST(3)=1, NDAY_SST(3)=2, XTIME_SST(3)=0.
/
```

4.1.5 Namelist NAM_DATA_FLAKE

Over lakes, if one wants to use FLake scheme, some parameters have to be specified by the user in the namelist NAM_DATA_FLAKE.

Name	Type	Values	Default	X-Reference
XUNIF_WATER_DEPTH	real	20.		
YWATER_DEPTH	character(LEN=28)	' '		
YWATER_DEPTHFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF', 'ASCLLV', 'BINLLV'	none none	
YWATER_DEPTH_STATUS	character(LEN=28)	' '		
XUNIF_WATER_FETCH	real	1000.		
YWATER_FETCH	character(LEN=28)	' '		
YWATER_FETCHFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF', 'ASCLLV', 'BINLLV'	none none	
XUNIF_T_BS	real	286.		
YT_BS	character(LEN=28)	' '		
YT_BSFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF', 'ASCLLV', 'BINLLV'	none none	
XUNIF_DEPTH_BS	real	1.		
YDEPTH_BS	character(LEN=28)	' '		
YDEPTH_BSFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF', 'ASCLLV', 'BINLLV'	none none	
XUNIF_EXTCOEF_WATER	real	3.		
YEXTCOEF_WATER	character(LEN=28)	' '		
YEXTCOEF_WATERFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF', 'ASCLLV', 'BINLLV'	none none	

- XUNIF_WATER_DEPTH: Lake depth (m)
- YWATER_DEPTH: file name
- YWATER_DEPTHFILETYPE: file type
- YWATER_DEPTH_STATUS: status file name

- XUNIF_WATER_FETCH: wind fetch (m)
- YWATER_FETCH: file name
- YWATER_FETCHFILETYPE: file type
- XUNIF_T_BS: temperature at the outer edge of the thermally active layer of the bottom sediments (K)
- YT_BS: file name
- YT_BSFILETYPE: file type
- XUNIF_DEPTH_BS: depth of the sediments layer (m)
- YDEPTH_BS: file name
- YDEPTH_BSFILETYPE: file type
- XUNIF_EXTCOEF_WATER: extinction coefficient of solar radiation in water (m^{-1})
- YEXTCOEF_WATER: file name
- YEXTCOEF_WATERFILETYPE: file type

4.1.6 Namelist NAM_TEB

Name	Type	Values	Default	X-Reference
NTEB_PATCH	integer		1	
CBEM	character(LEN=3)	'DEF','BEM'	'DEF'	
CCOOL_COIL	character(LEN=6)	'IDEAL ','DXCOIL'	'IDEAL '	
CHEAT_COIL	character(LEN=6)	'IDEAL ','FINCAP'	'IDEAL '	
LAUTOSIZE	logical		F	
CROAD_GRID	character(LEN=6)	'LOW3','LOW5','MEDIUM','HIGH'	'LOW5'	
NFLOOR_LAYER	integer		5	
NMASS_LAYER	integer		5	
NBEMCOMP	integer	1,2,3,4,5,6,7,8,9	1	
NROOF_LAYER	integer		5	
NWALL_LAYER	integer		5	
LGREENROOF	logical		F	
LURBHYDRO	logical		F	
LSOLAR_PANEL	logical		F	
LSPARTACUS	logical		F	
LEXPLW	logical		F	
CURBTREE	character(LEN=4)	'TREE','GRWL','NONE'	'NONE'	
NTIME_CHANGE	integer		0	
LCHECK_TEB	logical		T	
XEPS_BDGT_GLOB	real		1E-3	
XEPS_BDGT_FAC	real		1E-6	

- NTEB_PATCH: number of TEB patches (corresponding to the roads orientations)
- CBEM: TEB option for the building energy model :
  - DEF: default version force-restore model from Masson et al. 2002
  - BEM: Building Energy Model Bueno et al. 2011
- CCOOL_COIL: type of cooling coil
- CHEAT_COIL: type of heating coil
- LAUTOSIZE: flag to activate autosize calculations

- CROAD_GRID : type of vertical grid for soil and roads. The following options are currently available :
  - 'LOW3': low-resolution for structural-road vertical grid. If 'LOW3', NTEB_ROAD=3 and NTEB_SOIL=3. ISBA "DIF" option for gardens not possible with "LOW3" TEB soil grid.
  - 'LOW5': low-resolution structural road vertical grid. If 'LOW5', NTEB_ROAD=4 and NTEB_SOIL=5.
  - 'MEDIUM': medium-resolution for structural-road vertical grid. If 'MEDIUM', NTEB_ROAD=9 and NTEB_SOIL=12.
  - 'HIGH': high-resolution for structural-road vertical grid. If 'HIGH', NTEB_ROAD=11 and NTEB_SOIL=14.
- NFLOOR_LAYER :number of layers in floors
- NMASS_LAYER : Number of layers in mass (BEM). This refers to the computational grid.
- NBEMCOMP: Number of compartiments in BEM.
- NROOF_LAYER: number of layers in roofs
- NWALL_LAYER: number of layers in walls
- LGREENROOF: logical to call ISBA from TEb for GREENROOF
- LURBHYDRO: urban subsoil and hydrology processes. (remplace LHYDRO)
- LSOLAR_PANEL :solar panels on roofs
- LSPARTACUS: Key for SPARTACUS-Surface activation. Option to calculate explicitly the long-wave radiative exchanges between facets.
- LEXPLM: Key for explicit calculation of longwave radiation.
- CURBTREE : TEB option for the high vegetation : street trees or green walls. Only if LGARDEN is T. The following options are currently available :
  - 'TREE': street trees (middle of the street)
  - 'GRWL': green walls (trees near walls) but not implemented yet.
  - 'NONE'
- NTIME_CHANGE: Number of time shifts during simulation (e.g. between winter time and daylight saving time)
- LCHECK_TEB: If T, verification of energy budget for TEB
- XEPS_BDGT_GLOB: Difference allowed in energy budget for TEB for global processes.
- XEPS_BDGT_FAC: Difference allowed in energy budget for TEB for facade processes.

4.1.7 Namelist NAM_MEB_ISBA

MEB (Multi Energy Balance) scheme is now available but this is a "beta version". Attention, only forest patches are validated. So if you used 12 land patches, MEB must be only activated over tiles 4, 5 and/or 6. Other limitation: for instance, MEB can not be use with all Ad-s options (AST, NIT, CC).

Name	Type	Values	Default	X-Reference
LMEB_PATCH	logical(19)		F	
LFORC_MEASURE	logical		F	
LMEB_LITTER	logical		F	
LMEB_GNDRES	logical		F	

- LMEB_PATCH: vector that activates MEB over selected patches. For example if you use 12 patches: LMEB_PATCH = F,F,F,T,T,T,F,F,F,F,F,F (= only forest patches).
- LFORC_MEASURE: if T, forcing data from observations.
- LMEB_LITTER: Activates litter
- LMEB_GNDRES: Activates ground resistance

4.2 Choice of the grid

There are 3 possibilities. 2 are always possible, one is available only if the PGD routine is integrated into an atmospheric model initialization facility.

1. The grid is chosen via namelists options (see below)
2. The grid is defined as a part of the grid of an already existing surface file, indicated via namelists (see below)
3. The grid is defined as being identical to the one of an atmospheric model, which is given as fortran argument in the coupling of the PGD surface facilities (routine PGD_SURF_ATM) into an atmospheric model initialization procedures. In this case, all namelists that are usually used to define the surface grid are ignored. Note that, in addition to the grid, the orography can also be given from the atmospheric file.

Note that all the namelists presented in this section are ignored if the grid is imposed, in the fortran code, from an atmospheric model. This is the case when one already have defined the atmospheric grid and one want to be sure that the surface has the same grid. For example, this is what happens in the MESONH program PREP_IDEAL_CASE (when no physiographic surface file is used). If you are in this case, ignore all the namelists presented in this section, and only the namelists for cover and the following ones, have to be used.

4.2.1 Namelist NAM_PGD_GRID

This namelist defines the grid type, either specified or from an existing surface file.

Name	Type	Values	Default	X-Reference
CGRID	character(LEN=10)		"CONF PROJ "	
YINIFILE	character(LEN=28)		none	
YINIFILETYPE	character(LEN=6)		none	
NOVMX	integer		1	

- CGRID: type of grid and projection . It is used only if a file is not prescribed (see below). The different grid possibilities are:
  - "GAUSS ": this grid is a gaussian grid (global grid, that may be stretched, rotated, ...).
  - "CONF PROJ ": this grid is a regular grid (in meters in x and y perpendicular directions) on conformal projection plan (Mercator, Lambert or polar stereographic).
  - "CARTESIAN ": this grid is a regular grid (in meters in x and y perpendicular directions), with no reference to real geographical coordinates.
  - "LONLAT REG": this grid is defined as a regular latitude - longitude grid.
  - "LONLATVAL ": this grid is defined as a not regular latitude - longitude grid (all points and mesh sizes are defined).
  - "LONLAT ROT": rotated lonlat (from Hirlam).
  - "IGN ": this grid type contains all IGN (French National Geographical Institute) possible Lambert projections
  - "NONE ": this grid is not regular. Only the number of points and the size of each grid mesh is prescribed. There is no positioning of each point compared to any other.
- YINIFILE: name of the file used to define the grid. It is possible to define the grid as a subgrid of a previously created file. This is currently possible only for files that have a "CONF PROJ " or "CARTESIAN " grid type. The exact definition of the subgrid grid chosen is prescribed in a namelist (described below), depending on the type of grid available in the file chosen. The use of a file has priority on the CGRID type.

- YINIFILETYPE: type of the YINIFILE file, if the latter is provided. YFILETYPE must be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "LFI"/"ASCII": the file type is a PREP LFI or ASCII file.
- NOVMX: number of points that can overlap each other in the user grid, for the calculation of physiographic fields.

4.2.2 Namelist NAM_CONF_PROJ

This namelist defines the projection in case CGRID="CONF PROJ ".

Name	Type	Values	Default	X-Reference
XLAT0	real	none		
XLON0	real	none		
XRPK	real	none		
XBETA	real	none		

- XLAT0: reference latitude for conformal projection (real, decimal degrees)
- XLON0: reference longitude for conformal projection (real, decimal degrees)
- XRPK: cone factor for the projection (real):
  - XRPK=1: polar stereographic projection from north pole
  - 1>XRPK>0: Lambert projection from south pole
  - XRPK=0: Mercator projection from earth center
  - -1<XRPK<0: Lambert projection from north pole
  - XRPK=-1: polar stereographic projection from south pole
- XBETA: rotation angle of the simulation domain around the reference longitude (real)

4.2.3 Namelist NAM_CONF_PROJ_GRID

This namelists defines the horizontal domain in case CGRID="CONF PROJ ".

Name	Type	Values	Default	X-Reference
XLATCEN	real	none		
XLONCEN	real	none		
NIMAX	integer	none		
NJMAX	integer	none		
XDX	real	none		
XDY	real	none		

- XLATCEN: latitude of the point of the center of the domain (real, decimal degrees)
- XLONCEN: longitude of the point of the center of the domain (real, decimal degrees)
- NIMAX: number of surface points of the grid in direction x.
- NJMAX: number of surface points of the grid in direction y.
- XDX: grid mesh size on the conformal plane in x direction (real, meters).
- XDY: grid mesh size on the conformal plane in y direction (real, meters).

4.2.4 Namelist NAM_INIFILE_CONF_PROJ

This namelists defines the horizontal domain from an existing surface file in which grid type is "CONF PROJ ". If nothing is set in the namelist, a grid identical as the one in the file is chosen.

Name	Type	Values	Default	X-Reference
IXOR	integer	1		
IYOR	integer	1		
IXSIZE	integer	YINIFILE size		
IYSIZE	integer	YINIFILE size		
IDXRATIO	integer	1		
IDYRATIO	integer	1		

- IXOR: first point I index, according to the YINIFILE grid, left to and out of the new physical domain.
- IYOR: first point J index, according to the YINIFILE grid, under and out of the new physical domain.
- IXSIZE: number of grid points in I direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IYSIZE: number of grid points in J direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IDXRATIO: resolution factor in I direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IDYRATIO: resolution factor in J direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.

4.2.5 Namelist NAM_CARTESIAN

This namelist defines the projection in case CGRID="CARTESIAN ".

Name	Type	Values	Default	X-Reference
XLAT0	real	none		
XLON0	real	none		
NIMAX	integer	none		
NJMAX	integer	none		
XDX	real	none		
XDY	real	none		

- XLAT0: reference latitude (real, decimal degrees)
- XLON0: reference longitude (real, decimal degrees)
- NIMAX: number of surface points of the grid in direction x.
- NJMAX: number of surface points of the grid in direction y.
- XDX: grid mesh size on the conformal plane in x direction (real, meters).
- XDY: grid mesh size on the conformal plane in y direction (real, meters).

4.2.6 Namelist NAM_INIFILE_CARTESIAN

This namelists defines the horizontal domain from an existing surface file in which grid type is "CARTESIAN ". If nothing is set in the namelist, a grid identical as the one in the file is chosen.

Name	Type	Values	Default	X-Reference
IXOR	integer	1		
IYOR	integer	1		
IXSIZE	integer	YINIFILE size		
IYSIZE	integer	YINIFILE size		
IDXRATIO	integer	1		
IDYRATIO	integer	1		

- IXOR: first point I index, according to the YINIFILE grid, left to and out of the new physical domain.
- IYOR: first point J index, according to the YINIFILE grid, under and out of the new physical domain.
- IXSIZE: number of grid points in I direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IYSIZE: number of grid points in J direction, according to YINIFILE grid, recovered by the new domain. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IDXRATIO: resolution factor in I direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.
- IDYRATIO: resolution factor in J direction between the YINIFILE grid and the new grid. If to be used in MESONH, it must only be factor of 2,3 or 5.

4.2.7 Namelist NAM_LONLAT_REG

This namelist defines the projection in case CGRID="LONLAT REG".

Name	Type	Values	Default	X-Reference
XLONMIN	real	none		
XLONMAX	real	none		
XLATMIN	real	none		
XLATMAX	real	none		
NLON	integer	none		
NLAT	integer	none		

- XLONMIN: minimum longitude covered by the grid, i.e. corresponding to the west border of the domain (real, decimal degrees). XLONMIN must be smaller than XLONMAX, but no more than 360 smaller.
- XLONMAX: maximum longitude covered by the grid, i.e. corresponding to the east border of the domain (real, decimal degrees). XLONMAX must be larger than XLONMIN, but no more than 360 larger.
- XLATMIN: minimum latitude covered by the grid, i.e. corresponding to the south border of the domain (real, decimal degrees). XLATMIN must be between -90 and +90, and smaller than XLATMAX.
- XLATMAX: maximum longitude covered by the grid, i.e. corresponding to the 'right' border of the domain (real, decimal degrees). XLATMAX must be between -90 and +90, and larger than XLATMIN.
- NLON: number of surface points in the longitude direction.
- NLAT: number of surface points in the latitude direction.

4.2.8 Namelist NAM_LONLATVAL

This namelist defines the projection in case CGRID="LONLATVAL ".

Name	Type	Values	Default	X-Reference
NPOINTS	integer	none		
XX	real	none		
XY	real	none		
XDX	real	none		
XDY	real	none		

- NPOINTS: number of grid points defining the grid
- XX: longitude of grid mesh center (degrees East)
- XY: latitude coordinate of grid mesh center (degrees North)
- XDX: grid mesh size in x direction (degrees)
- XDY: grid mesh size in y direction (degrees)

4.2.9 Namelist NAM_LONLAT_ROT

This namelist defines the projection in case CGRID="LONLAT ROT".

Name	Type	Values	Default	X-Reference
XWEST	real			
XSOUTH	real			
XDLON	real			
XDLAT	real			
XPOLON	real			
XPOLAT	real			
NLON	integer			
NLAT	integer			

- XWEST: West longitude in rotated grid (degrees)
- XSOUTH: South latitude in rotated grid (degrees)
- XDLON: Longitudal grid spacing (degrees)
- XDLAT: Latitudal grid spacing (degrees)
- XPOLON: Longitude of rotated pole (degrees)
- XPOLAT: Latitude of rotated pole (degrees)
- NLON: number of points in longitude
- NLAT: number of points in latitude

4.2.10 Namelist NAM_IGN

This namelist defines the projection in case CGRID="IGN ".

Name	Type	Values	Default	X-Reference
CLAMBERT	character(LEN=3)	'L1 ', 'L2 ', 'L3 ', 'L4 ', 'L2E', 'L93'	none	
NPOINTS	integer		none	
XX	real		none	
XY	real		none	
XDX	real		none	
XDY	real		none	
XCELLSIZE	real		1.E+20	
XX_LLCORNER	real		1.E+20	
XY_LLCORNER	real		1.E+20	
NCOLS	integer		0	
NROWS	integer		0	

- CLAMBERT: type of Lambert projection
  - "L1 ": Lambert I
  - "L2 ": Lambert II
  - "L3 ": Lambert III
  - "L4 ": Lambert IV
  - "L2E": Extended Lambert II
  - "L93": Lambert 93
- NPOINTS: number of grid points defining the grid
- XX: X coordinate of grid mesh center
- YY: Y coordinate of grid mesh center
- XDX: grid mesh size on the conformal plane in x direction (real, meters).
- XDY: grid mesh size on the conformal plane in y direction (real, meters).
- XCELLSIZE: size of the cell (equal in X and Y). Has priority on XDX and XDY.
- XX_LLCORNER: X coordinate of left side of the domain.
- XY_LLCORNER: Y coordinate of lower side of the domain.
- NCOLS: number of columns.
- NROWS: number of rows.

The simultaneous use of XX_LLCORNER, XY_LLCORNER, NCOLS and NROWS has priority of this of NPOINTS, XX and YY (it simplifies the namelist in case of a regular grid).

4.2.11 Gaussian grid

These namelists define the projection in case CGRID="GAUSS ".

NAMDIM				
Name	Type	Values	Default	X-Reference
NDGLG	integer		none	

- NDGLG: number of pseudo-latitude

NAMRGRI				
Name	Type	Values	Default	X-Reference
NRGRI	integer		none	

- NRGRI: number of pseudo-longitudes on each pseudo-latitude circle starting from the rotated pole

NAMGEM				
Name	Type	Values	Default	X-Reference
RMUCEN	real		none	
RLOCEN	real		none	
RSTRET	real		none	

- RMUCEN: sine of the latitude of the rotated pole
- RLOCEN: longitude of the rotated pole (radian)
- RSTRET: stretching factor (must be greater than or equal to 1)

4.3 Definition of orography and bathymetry

4.3.1 NAM_ZS

This namelist defines the orography file and orographic treatment to be done.

Name	Type	Values	Default	X-Reference
XUNIF_ZS	real		none	
YZS	character(LEN=28)		' '	
YZSFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none none	
COROGTYPE	character(LEN=3)	'AVG', 'ENV', 'SIL ', 'MAX'	'ENV'	
XENV	real		0.	
LIMP_ZS	logical		F	
YSLOPE	character(LEN=28)		"	
YSLOPEFILETYPE	character(LEN=6)	", 'NETCDF'	"	
LEXPLICIT_SLOPE	logical		F	
LORORAD	logical		F	
NSECTORS	integer		8	
XRFSSO	real		1.0	
XHALORADIUS	real		20000.0	
NFSSOMAX	integer		30	
CSVF	character(LEN=16)	'SENKOVA','MANNERS'	'MANNERS'	
LFSSOVF	logical		F	

- XUNIF_ZS: uniform value of orography imposed on all points (real,meters). If XUNIF_ZS is set, file YZS is not used.
- YZS: data file name. If XUNIF_ZS is set, file YZS is not used. If neither XUNIF_ZS and YZS is set, then orography is set to zero.
- YZSFILETYPE: type of data file
- COROGTYPE: type of orography:
  - 'AVG': mean orography $\overline{Z_s}$.
  - 'ENV': envelope relief, defined from mean orography and the subgrid orography standard deviation as: $\overline{Z_s} + XENV * \sigma(Z_s)$
  - 'SIL': silhouette relief, defined as the mean of the two subgrid silhouettes in directions x and y (if two main directions can be defined for the grid chosen).
  - 'MAX': maximum orography over grid box (avoid averaging in case of sea/land grid box).
- XENV: enhance factor in envelope orography definition (real).
- LIMP_ZS: reads orography from an existing PGD file
- YSLOPE: file name for slope
- YSLOPEFILETYPE: data file type for slope
- LEXPLICIT_SLOPE: Slope is computed from explicit ZS field and not subgrid orography
- LORORAD: flag to activate orographic radiation parameters in PGD step. New fields are created in the PGD and used in the simulation if orographic shadowing is activated (with LDSV, LDSL or LDSH)
- NSECTORS: number of aspect sectors
- XRFSSO: reduction factor for computing NFSSO
- XHALORADIUS: radius of the halo in which the horizon is computed (m)

- NFSSOMAX : max for NFSSO (limit for memory reasons)
- CSVF : formula for SVF computation
  - 'SENKOVA' = Senkova et al. 2007
  - 'MANNERS' = Manners et al. 2012 (default)
- LFSSOVF : compute SVF (sky view factor) on fractional slopes if possible

4.3.2 NAM_SEABATHY

Name	Type	Values	Default	X-Reference
XUNIF_SEABATHY	real	negative for real ocean	300	
YSEABATHY	character(LEN=28)		' '	
YSEABATHYFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV' 'ASCLLV','NETCDF'	none	
YNCVARNAME	character(LEN=28)			

- XUNIF_SEABATHY: uniform value of bathymetry imposed on all points (real,meters). If XUNIF_SEABATHY is set, file YSEABATHY is not used.
- YSEABATHY: data file name. If XUNIF_SEABATHY is set, file YSEABATHY is not used. If neither XUNIF_SEABATHY and YSEABATHY is set, then bathymetry is set to zero.
- YSEABATHYFILETYPE: type of data file ('NETCDF')
- YNCVARNAME: name of variable to be read in NETCDF file

4.4 Land cover data

- ECOCLIMAP is a global database of surface parameters.
  It's composed of a global land cover map, in which each ecosystem or cover is described by, at first level, 4 fractions of the 4 main surface types or tiles (SEA, WATER, NATURE, TOWN), and then, at second level in tile NATURE, 19 fractions of the 19 vegetation types or PFTs (Plant Functional Types).
  These 19 PFTs are listed in the table below. Then, surface parameters, like LAI, albedo, fraction of vegetation, soil depths, roughness length, depend on the PFTs, and, for some of them (LAI, soil depths, heights of trees), also on the cover. The user can use ECOCLIMAP or give values for the parameters fields, in the namelist.
  If ECOCLIMAP is used, surface parameters are defined through the ECOCLIMAP global map of ecosystems, following rules of attribution of parameters.

- ECOCLIMAP Second Generation (ECOCLIMAP-SG) is the latest version of ECOCLIMAP, produced at 300m-resolution and following a new philosophy. First, the land cover map is directly composed of the vegetation and urban types used in ISBA and TEB: each grid point of the map represents a pure type, either inland water bodies, or sea and ocean, or one vegetation type or one urban type. In other words, the notion of "cover" or ecosystem of homogeneous land cover type containing several fractions of vegetation types is abandoned. The 20 PFTs are listed in the table below (sea, lakes, ocean and the 10 urban local climate zones are not listed). Secondly, the vegetation primary parameters (LAI, ground depths, height of trees, visible and near infrared soil and vegetation albedos), that are defined and averaged by cover in classic ECOCLIMAP, are now given to the PGD step throught the namelist NAM_DATA_ISBA. Consequently, they can be uniform values or input maps coming from satellite data, for example. Some default maps or values of these parameters are provided with the current version of ECOCLIMAP-SG. However, each user can use his own maps of parameters according to his specific case, he can also add new maps for parameters that are not externalized by the namelist in the default version.

ECOCLIMAP-I and II		ECOCLIMAP-SG	
1	no vegetation (smooth) - NO	1	no vegetation (smooth) - NO
2	no vegetation (rocks) - ROCK	2	no vegetation (rocks) - ROCK
3	permanent snow and ice - SNOW	3	permanent snow and ice - SNOW
4	temperate broadleaf cold-deciduous summergreen - TEBD	4	boreal broadleaf deciduous - BOBD
5	boreal needleleaf evergreen - BONE	5	temperate broadleaf deciduous - TEBD
6	tropical broadleaf evergreen - EVER	6	tropical broadleaf deciduous - TRBD
7	C3 cultures types - C3	7	temperate broadleaf evergreen - TEBE
8	C4 cultures types - C4	8	tropical broadleaf evergreen - TRBE
9	irrigated crops - IRR	9	boreal needleleaf evergreen - BONE
10	grassland (C3) - GRAS	10	temperate needleleaf evergreen - TENE
11	tropical grassland (C4) - TROG	11	boreal needleleaf deciduous - BOND
12	peat bogs, parks and gardens (irrigated grass) - PARK	12	shrubs - SHRB
13	tropical broadleaf deciduous - TRBD	13	boreal grassland- BOGR
14	temperate broadleaf evergreen - TEBE	14	temperate grassland - GRAS
15	temperate needleleaf evergreen - TENE	15	tropical grassland - TROG
16	boreal broadleaf cold-deciduous summergreen - BOBD	16	winter C3 crops - C3W
17	boreal needleleaf cold-deciduous summergreen - BOND	17	summer C3 crops - C3S
18	boreal grass - BOGR	18	C4 crops - C4
19	shrub - SHRB	19	flooded trees - FLTR
		20	flooded grassland - FLGR

4.4.1 NAM_FRAC

This namelist defines if ECOCLIMAP mechanism based on fractions of covers will be used or not.
It's also where the fractions of the 4 main types of surfaces or tiles are given if ECOCLIMAP is not used to define them.

Name	Type	Values	Default	X-Reference
LECOCLIMAP	logical		T	
LECOSG	logical		F	
XUNIF_SEA	real	[0-1]	none	
CFNAM_SEA	character(LEN=28)		' '	
CFTYP_SEA	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV', 'ASCLLV'	none	
XUNIF_WATER	real	[0-1]	none	
CFNAM_WATER	character(LEN=28)		' '	
CFTYP_WATER	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV', 'ASCLLV'	none	
XUNIF_NATURE	real	[0-1]	none	
CFNAM_NATURE	character(LEN=28)		' '	
CFTYP_NATURE	character(LEN=6)	'DIRECT', 'BINLLF','BINLLV', 'ASCLLV'	none	
XUNIF_TOWN	real	between 0 and 1	none	
CFNAM_TOWN	character(LEN=28)		' '	
CFTYP_TOWN	character(LEN=6)		' '	

- LECOCLIMAP: flag to use ECOCLIMAP or not. From version 7.1, it's possible to partially use ECOCLIMAP to complete missing parameters when they are given directly in the namelist.
- LECOSG: flag to use ECOCLIMAP-SG database (from SURFEX 8.1)
- XUNIF_SEA: uniform prescribed value of sea fraction. If XUNIF_SEA is set, file CFNAM_SEA is not used.
- CFNAM_SEA: sea fraction data file name. If XUNIF_SEA is set, file CFNAM_SEA is not used.
- CFTYP_SEA: type of sea data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_WATER: uniform prescribed value of water fraction. If XUNIF_WATER is set, file CFNAM_WATER is not used.
- CFNAM_WATER: water fraction data file name. If XUNIF_WATER is set, file CFNAM_WATER is not used.
- CFTYP_WATER: type of water data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_NATURE: uniform prescribed value of nature fraction. If XUNIF_NATURE is set, file CFNAM_NATURE is not used.
- CFNAM_NATURE: nature fraction data file name. If XUNIF_NATURE is set, file CFNAM_NATURE is not used.
- CFTYP_NATURE: type of nature data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')
- XUNIF_TOWN: uniform prescribed value of town fraction. If XUNIF_TOWN is set, file CFNAM_TOWN is not used.
- CFNAM_TOWN: town fraction data file name. If XUNIF_TOWN is set, file CFNAM_TOWN is not used.
- CFTYP_TOWN: type of town data file ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV')

4.4.2 NAM_COVER

This namelist gives the information to compute the surface cover fractions when ECOCLIMAP is used. It is possible to use an existing ECOCLIMAP map or the define the ECOCLIMAP covers for the user's domain.

Name	Type	Values	Default	X-Reference
XUNIF_COVER	array of 573 reals	$\geq 0.$	none	
YCOVER	character(LEN=28)		' '	
YCOVERFILETYPE	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV' 'ASCLLV'	none	
XRM_COVER	real	$\geq 0.$	10^{-6}	
XRM_COAST	real	$\geq 0.$	1.	
XRM_LAKE	real	$\geq 0.$	0.	
XRM_SEA	real	$\geq 0.$	0.	
LORCA_GRID	logical		F	
XLAT_ANT	real		-77.	
LIMP_COVER	logical		F	
LRM_RIVER	logical		F	

- XUNIF_COVER: specified values for uniform cover fractions. For each index i between 1 and 573, XUNIF_COVER(i) is the fraction of the ith ecosystem of ecoclimap. The same fraction of each ecosystem is set to all points of the grid. The sum of all ecosystem fractions must be equal to one: $\sum_{i=1}^{573} XUNIF\_COVER(i) = 1$. If XUNIF_COVER is set, it has priority on the use of an ecosystem file (see next item: YCOVER). In the case of grid without any reference to geographical coordinates ("CARTESIAN " or "NONE "), XUNIF_COVER must be set.
- YCOVER: ecoclimap data file name. It is used only if XUNIF_COVER is not set.
- YCOVERFILETYPE: type of YCOVER file ('DIRECT', 'BINLLV', 'BINLLF', 'ASCLLV').
- XRM_COVER: for each point, all fractions of ecosystems that are below XRM_COVER are removed (i.e. set to zero), and the corresponding area fractions are distributed among the remaining ecosystem fractions. Whatever the value of XRM_COVER, at least one ecosystem remains for each grid point.
- XRM_COAST: limit of coast coverage under which the coast is replaced by sea or inland water.
- XRM_LAKE: limit of inland lake coverage under which the water is removed.
- XRM_SEA: limit of sea coverage under which the sea is removed.
- LORCA_GRID: flag to ensure the compatibility between surfex and Orca grid which minimal latitude over Antarctica is 77S
- XLAT_ANT: minimum Orca grid latitude over Antarctica
- LIMP_COVER: reads the cover fractions in an existing PGD file to avoid their computation
- LRM_RIVER: if T, rivers (cover 3) are removed.

4.4.3 NAM_PGD_ARRANGE_COVER

This namelist initializes change water (not lake) to nature and/or town to rock keys.

Name	Type	Values	Default	X-Reference
LWATER_TO_NATURE	logical		F	
LTOWN_TO_ROCK	logical		F	
LTOWN_TO_COVER	logical		F	
NREPLACE_COVER	integer			

- LWATER_TO_NATURE: Change Wetland treated as inland water into nature, i.e. covers with $0. \leq$ FRAC_WATER $\leq 1.$
- LTOWN_TO_ROCK: Change Town into Rock
- LTOWN_TO_COVER: Option to replace (if T) urban landuse by the ecoclimap cover ICOVER
- NREPLACE_COVER: cover number to replace urban by this cover. If LTOWN_TO_COVER=T and NREPLACE=ICOVER, the urban landuse is replaced by the ECOCLIMAP cover number ICOVER (ICOVER must be present in the domain)

4.4.4 NAM_READ_DATA_COVER

Name	Type	Values	Default	X-Reference
LREAD_DATA_COVER	logical		F	

- : LREAD_DATA_COVER: if T, covers data are read in .bin files; if F, in fortran routines

4.4.5 NAM_WRITE_COVER_TEX

Name	Type	Values	Default	X-Reference
CLANG	character(LEN=2)	' '	'EN'	

- CLANG: language used in the file class_cover_tex.tex

4.4.6 List of ECOCLIMAP cover names

For the list of the names of ECOCLIMAP-I and ECOCLIMAP-II covers, see appendix A.
For the list of the names of ECOCLIMAP-SG covers, see appendix B.

4.4.7 NAM_DATA_ISBA

Over natural areas, all surface parameters for each vegtype at a given frequency have to be specified by the user in namelist NAM_DATA_ISBA.

If LECOCLIMAP = T (NAM_FRAC), only part of the surface parameters for each vegtype can be given in NAM_DATA_ISBA. They are then completed by ECOCLIMAP data.

If only data for some of the vegtypes are given, other vegtypes are filled with the values of the first given vegtype placed before in the list.
The order of the vegtypes is as indicated in the table 4.4

Naming convention: XUNIF_* is to give a constant value for a parameter. CFNAME_* and CFTYP_* to indicate respectively the file name and the type of file for this parameter.

NAM_DATA_ISBA				
parameters depending on vegetation types				
Name	Type	Values	Default	X-Reference
XUNIF_VEGTYPE	real	[0 - 1]	none	
CFNAM_VEGTYPE	character(LEN=28)			
CFTYP_VEGTYPE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_RSMIN	real		none	
CFNAM_RSMIN	character(LEN=28)		' '	
CFTYP_RSMIN	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GAMMA	real		none	
CFNAM_GAMMA	character(LEN=28)		' '	
CFTYP_GAMMA	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

Name	Type	Values	Default	X-Reference
XUNIF_WRMAX_CF	real		none	
CFNAM_WRMAX_CF	character(LEN=28)		' '	
CFTYP_WRMAX_CF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_RGL	real		none	
CFNAM_RGL	character(LEN=28)		' '	
CFTYP_RGL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_CV	real		none	
CFNAM_CV	character(LEN=28)		' '	
CFTYP_CV	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_Z0_O_Z0H	real		none	
CFNAM_Z0_O_Z0H	character(LEN=28)		' '	
CFTYP_Z0_O_Z0H	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SEED_M	real	[1 - 12]	none	
CFNAM_SEED_M	character(LEN=28)			
CFTYP_SEED_M	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SEED_D	real	[1 - 31]	none	
CFNAM_SEED_D	character(LEN=28)			
CFTYP_SEED_D	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_REAP_M	real	[1 - 12]	none	
CFNAM_REAP_M	character(LEN=28)			
CFTYP_REAP_M	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_REAP_D	real	[1 - 31]	none	
CFNAM_REAP_D	character(LEN=28)			
CFTYP_REAP_D	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SEED_S2_M	real	[1 - 12]	none	
CFNAM_SEED_S2_M	character(LEN=28)			
CFTYP_SEED_S2_M	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SEED_S2_D	real	[1 - 31]	none	
CFNAM_SEED_S2_D	character(LEN=28)			
CFTYP_SEED_S2_D	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_REAP_S2_M	real	[1 - 12]	none	
CFNAM_REAP_S2_M	character(LEN=28)			
CFTYP_REAP_S2_M	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_REAP_S2_D	real	[1 - 31]	none	
CFNAM_REAP_S2_D	character(LEN=28)			
CFTYP_REAP_S2_D	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SEED_S3_M	real	[1 - 12]	none	
CFNAM_SEED_S3_M	character(LEN=28)			
CFTYP_SEED_S3_M	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SEED_S3_D	real	[1 - 31]	none	
CFNAM_SEED_S3_D	character(LEN=28)			
CFTYP_SEED_S3_D	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

Name	Type	Values	Default	X-Reference
XUNIF_REAP_S3_M	real	[1 - 12]	none	
CFNAM_REAP_S3_M	character(LEN=28)			
CFTYP_REAP_S3_M	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_REAP_S3_D	real	[1 - 31]	none	
CFNAM_REAP_S3_D	character(LEN=28)			
CFTYP_REAP_S3_D	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_IRRIGTYPE	real	0,1,2,3	none	
CFNAM_IRRIGTYPE	character(LEN=28)			
CFTYP_IRRIGTYPE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_IRRIGFRAC	real		none	
CFNAM_IRRIGFRAC	character(LEN=28)			
CFTYP_IRRIGFRAC	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_IRRIGFREQ	real		none	
CFNAM_IRRIGFREQ	character(LEN=28)			
CFTYP_IRRIGFREQ	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_IRRIGTIME	real		none	
CFNAM_IRRIGTIME	character(LEN=28)			
CFTYP_IRRIGTIME	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

- XUNIF_VEGTYPE / CFNAM_VEGTYPE / CFTYP_VEGTYPE: fractions of each vegetation types
- XUNIF_RSMIN / CFNAM_RSMIN / CFTYP_RSMIN: minimal stomatal resistance (s/m)
- XUNIF_GAMMA / CFNAM_GAMMA / CFTYP_GAMMA: coefficient used in the computation of RSMIN (-)
- XUNIF_WRMAX_CF / CFNAM_WRMAX_CF / CFTYP_WRMAX_CF: coefficient for maximum interception water storage capacity (-)
- XUNIF_RGL / CFNAM_RGL / CFTYP_RGL: maximum solar radiation available for photosynthesis (W/m^2)
- XUNIF_CV / CFNAM_CV / CFTYP_CV: vegetation thermal inertia coefficient ($K\ m^2/J$)
- XUNIF_Z0_O_Z0H / CFNAM_Z0_O_Z0H / CFTYP_Z0_O_Z0H: ratio of surface roughness lengths (-)
- XUNIF_SEED_M / CFNAM_SEED_M / CFTYP_SEED_M: month of seeding
- XUNIF_SEED_D / CFNAM_SEED_D / CFTYP_SEED_D: day of seeding
- XUNIF_REAP_M / CFNAM_REAP_M / CFTYP_REAP_M: month of reaping
- XUNIF_REAP_D / CFNAM_REAP_D / CFTYP_REAP_D: day of reaping
- XUNIF_SEED_S2_M / CFNAM_SEED_S2_M / CFTYP_SEED_S2_M: month for a second season of seeding
- XUNIF_SEED_S2_D / CFNAM_SEED_S2_D / CFTYP_SEED_S2_D: day for a second season of seeding
- XUNIF_REAP_S2_M / CFNAM_REAP_S2_M / CFTYP_REAP_S2_M: month for a second season of reaping

- XUNIF_REAP_S2_D / CFNAM_REAP_S2_D / CFTYP_REAP_S2_D: day for a second season of reaping
- XUNIF_SEED_S3_M / CFNAM_SEED_S3_M / CFTYP_SEED_S3_M: month for a third season of seeding
- XUNIF_SEED_S3_D / CFNAM_SEED_S3_D / CFTYP_SEED_S3_D: day for a third season of seeding
- XUNIF_REAP_S3_M / CFNAM_REAP_S3_M / CFTYP_REAP_S3_M: month for a third season of reaping
- XUNIF_REAP_S3_D / CFNAM_REAP_S3_D / CFTYP_REAP_S3_D: day for a third season of reaping
- XUNIF_IRRIGTYPE / CFNAM_IRRIGTYPE / CFTYP_IRRIGTYPE: irrigation type when LIRRIGMODE or LECOSG are activated. 0 for none, 1 for sprinkling, 2 for dripping and 3 for flooding. By default an irrigated vegetation type is 1 (sprinkler) and the others 0.
- XUNIF_IRRIGFRAC / CFNAM_IRRIGFRAC / CFTYP_IRRIGFRAC: if LECOSG and LIRRIGMODE are activated, this key indicates the irrigation fraction [0-1] for each vegetation type (but only the vegetation types indicated in NUNIF_VEG_IRR_USE will be irrigated).
- XUNIF_IRRIGFREQ / CFNAM_IRRIGFREQ / CFTYP_IRRIGFREQ: if LIRRIGMODE, keys to indicate the minimum time (in s) between two irrigation triggers. By default it is defined with XUNIF_IRRIGFREQ_CTYPE: values for the 3 types of irrigation, respectively sprinkling, dripping and flooding.
- XUNIF_IRRIGTIME / CFNAM_IRRIGTIME / CFTYP_IRRIGTIME: if LIRRIGMODE, keys to indicate the duration of irrigation (in s).

NAM_DATA_ISBA				
Name	Type	Values	Default	X-Reference
NTIME	integer	1, 2, 12 or 36	36	
parameters depending on vegetation types and NTIME				
Name	Type	Values	Default	X-Reference
XUNIF_VEG	real	[0-1]	none	
CFNAM_VEG	character(LEN=28)			
CFTYP_VEG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_LAI	real		none	
CFNAM_LAI	character(LEN=28)			
CFTYP_LAI	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_Z0	real		none	
CFNAM_Z0	character(LEN=28)			
CFTYP_Z0	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_EMIS	real		none	
CFNAM_EMIS	character(LEN=28)			
CFTYP_EMIS	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALBNIR_VEG	real		none	
CFNAM_ALBNIR_VEG	character(LEN=28)			
CFTYP_ALBNIR_VEG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALBVIS_VEG	real		none	
CFNAM_ALBVIS_VEG	character(LEN=28)			
CFTYP_ALBVIS_VEG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

Name	Type	Values	Default	X-Reference
XUNIF_ALBUV_VEG	real		none	
CFNAM_ALBUV_VEG	character(LEN=28)			
CFTYP_ALBUV_VEG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALBNIR_SOIL	real		none	
CFNAM_ALBNIR_SOIL	character(LEN=28)			
CFTYP_ALBNIR_SOIL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALBVIS_SOIL	real		none	
CFNAM_ALBVIS_SOIL	character(LEN=28)			
CFTYP_ALBVIS_SOIL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALBUV_SOIL	real		none	
CFNAM_ALBUV_SOIL	character(LEN=28)			
CFTYP_ALBUV_SOIL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_IRRIG	real		none	
CFNAM_IRRIG	character(LEN=28)			
CFTYP_IRRIG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GNDLITTER	real			
XUNIF_Z0LITTER	real			
XUNIF_WATSUP	real		none	
CFNAM_WATSUP	character(LEN=28)			
CFTYP_WATSUP	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_F2THRESHOLD	real	[0-1]	none	
CFNAM_F2THRESHOLD	character(LEN=28)			
CFTYP_F2THRESHOLD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

- NTIME: time dimension for ISBA parameters. 1=a single value for the whole year / 2=two values from January to June, and from July to December / 12=monthly parameters / 36=parameters updated each 10 days
- XUNIF_VEG / CFNAM_VEG / CFTYP_VEG: fraction of vegetation for each vegetation types (-)
- XUNIF_LAI / CFNAM_LAI / CFTYP_LAI: leaf area index (m^2/m^2)
- XUNIF_Z0 / CFNAM_Z0 / CFTYP_Z0: roughness length (m)
- XUNIF_EMIS / CFNAM_EMIS / CFTYP_EMIS: emissivity (-)
- XUNIF_ALBNIR_VEG / CFNAM_ALBNIR_VEG / CFTYP_ALBNIR_VEG: vegetation near-infra-red albedo (-)
- XUNIF_ALBVIS_VEG / CFNAM_ALBVIS_VEG / CFTYP_ALBVIS_VEG: vegetation visible albedo (-)
- XUNIF_ALBUV_VEG / CFNAM_ALBUV_VEG / CFTYP_ALBUV_VEG: vegetation UV albedo(-)
- XUNIF_ALBNIR_SOIL / CFNAM_ALBNIR_SOIL / CFTYP_ALBNIR_SOIL: soil near-infra-red albedo (-)
- XUNIF_ALBVIS_SOIL / CFNAM_ALBVIS_SOIL / CFTYP_ALBVIS_SOIL: soil visible albedo (-)

- XUNIF_ALBUV_SOIL / CFNAM_ALBUV_SOIL / CFTYP_ALBUV_SOIL: soil UV albedo (-)
- XUNIF_IRRIG / CFNAM_IRRIG / CFTYP_IRRIG: flag for irrigation
- XUNIF_GNDLITTER: litter layer thickness (m)
- XUNIF_Z0LITTER: sub-forest canopy litter layer roughness (m)
- XUNIF_WATSUP / CFNAM_WATSUP / CFTYP_WATSUP: water supply during irrigation process (mm)
- XUNIF_F2THRESHOLD / CFNAM_F2THRESHOLD / CFTYP_F2THRESHOLD: if LIRRIGMODE, keys to indicate the threshold [0-1] for irrigation triggering. By default the value given by XTHRESHOLD in the namelist NAM_AGRI is used, but the value can be overwritten here.

NAM_DATA_ISBA				
parameters depending on vegetation types and soil levels:				
Name	Type	Values	Default	X-Reference
XUNIF_DG	real		none	
CFNAM_DG	character(LEN=28)			
CFTYP_DG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROOTFRAC	real		none	
CFNAM_ROOTFRAC	character(LEN=28)			
CFTYP_ROOTFRAC	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROOT_DEPTH	real		none	
CFNAM_ROOT_DEPTH	character(LEN=28)			
CFTYP_ROOT_DEPTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GROUND_DEPTH	real		none	
CFNAM_GROUND_DEPTH	character(LEN=28)			
CFTYP_GROUND_DEPTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROOT_EXTINCTION	real		none	
CFNAM_ROOT_EXTINCTION	character(LEN=28)			
CFTYP_ROOT_EXTINCTION	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROOT_LIN	real		none	
CFNAM_ROOT_LIN	character(LEN=28)			
CFTYP_ROOT_LIN	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

- XUNIF_DG / CFNAM_DG / CFTYP_DG: soil layer thickness (m)
- XUNIF_ROOTFRAC / CFNAM_ROOTFRAC / CFTYP_ROOTFRAC: root fraction (-)
- XUNIF_ROOT_DEPTH / CFNAM_ROOT_DEPTH / CFTYP_ROOT_DEPTH: root depth (-)
- XUNIF_GROUND_DEPTH / CFNAM_GROUND_DEPTH / CFTYP_GROUND_DEPTH: ground depth for hydrology (-)
- XUNIF_ROOT_EXTINCTION / CFNAM_ROOT_EXTINCTION / CFTYP_ROOT_EXTINCTION: root extinction percentage(-)
- XUNIF_ROOT_LIN / CFNAM_ROOT_LIN / CFTYP_ROOT_LIN : root linear parameter (-)

NAM_DATA_ISBA				
Isba-A-gs parameters				
Name	Type	Values	Default	X-Reference
LUNIF_STRESS	logical		T	
Isba-A-gs parameters depending on vegetation types				
XUNIF_GMES	real		none	
CFNAM_GMES	character(LEN=28)			
CFTYP_GMES	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_BSLAI	real		none	
CFNAM_BSLAI	character(LEN=28)			
CFTYP_BSLAI	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_LAIMIN	real		none	
CFNAM_LAIMIN	character(LEN=28)			
CFTYP_LAIMIN	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SEFOLD	real		none	
CFNAM_SEFOLD	character(LEN=28)			
CFTYP_SEFOLD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GC	real		none	
CFNAM_GC	character(LEN=28)			
CFTYP_GC	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_DMAX	real		none	
CFNAM_DMAX	character(LEN=28)			
CFTYP_DMAX	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_F2I	real		none	
CFNAM_F2I	character(LEN=28)			
CFTYP_F2I	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_H_TREE	real		none	
CFNAM_H_TREE	character(LEN=28)			
CFTYP_H_TREE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_RE25	real		none	
CFNAM_RE25	character(LEN=28)			
CFTYP_RE25	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_CE_NITRO	real		none	
CFNAM_CE_NITRO	character(LEN=28)			
CFTYP_CE_NITRO	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_CF_NITRO	real		none	
CFNAM_CF_NITRO	character(LEN=28)			
CFTYP_CF_NITRO	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_CNA_NITRO	real		none	
CFNAM_CNA_NITRO	character(LEN=28)			
CFTYP_CNA_NITRO	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

- XUNIF_GMES / CFNAM_GMES / CFTYP_GMES: mesophyll conductance (m/s^{-1})
- XUNIF_BSLAI / CFNAM_BSLAI / CFTYP_BSLAI :ratio d(biomass)/d(lai) (kg/m^2)
- XUNIF_LAIMIN / CFNAM_LAIMIN / CFTYP_LAIMIN: minimum LAI (m^2/m^2)

- XUNIF_SEFOLD / CFNAM_SEFOLD / CFTYP_SEFOLD: e-folding time for senescence (s)
- XUNIF_GC / CFNAM_GC / CFTYP_GC: cuticular conductance (m/s)
- XUNIF_DMAX / CFNAM_DMAX / CFTYP_DMAX: maximum air saturation deficit (kg/kg)
- XUNIF_F2I / CFNAM_F2I / CFTYP_F2I: critical normilized soil water content for stress parameterization (-)
- XUNIF_H_TREE / CFNAM_H_TREE / CFTYP_H_TREE: height of trees (m)
- XUNIF_RE25 / CFNAM_RE25 / CFTYP_RE25: Ecosystem respiration parameter (kg/kgms^{-1})
- XUNIF_CE_NITRO / CFNAM_CE_NITRO / CFTYP_CE_NITRO: leaf aera ratio sensivity to [nitrogen] (m^2/kg)
- XUNIF_CF_NITRO / CFNAM_CF_NITRO / CFTYP_CF_NITRO: lethal minimum value of leaf area ratio (m^2/kg)
- XUNIF_CNA_NITRO / CFNAM_CNA_NITRO / CFTYP_CNA_NITRO: nitrogen concentration of active biomass (kg/kg)
- LUNIF_STRESS: stress type

NAM_DATA_ISBA				
Hydraulic parameters, depending on soil levels				
Name	Type	Values	Default	X-Reference
XUNIF_CONDSAT	real		none	
CFNAM_CONDSAT	character(LEN=28)			
CFTYP_CONDSAT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_MPOTSAT	real		none	
CFNAM_MPOTSAT	character(LEN=28)			
CFTYP_MPOTSAT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_BCOEF	real		none	
CFNAM_BCOEF	character(LEN=28)			
CFTYP_BCOEF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_WSAT	real		none	
CFNAM_WSAT	character(LEN=28)			
CFTYP_WSAT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_WFC	real		none	
CFNAM_WFC	character(LEN=28)			
CFTYP_WFC	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_WWILT	real		none	
CFNAM_WWILT	character(LEN=28)			
CFTYP_WWILT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

- XUNIF_CONDSAT / CFNAM_CONDSAT / CFTYP_CONDSAT :hydraulic conductivity at saturation (m/s)
- XUNIF_MPOTSAT / CFNAM_MPOTSAT / CFTYP_MPOTSAT :matric potential at saturation (m)
- XUNIF_BCOEF / CFNAM_BCOEF / CFTYP_BCOEF :soil water CH78 b-parameter (-)
- XUNIF_WSAT / CFNAM_WSAT / CFTYP_WSAT: porosity profile (m^3/m^3)

- XUNIF_WFC / CFNAM_WFC / CFTYP_WFC: field capacity volumetric water content profile (m^3/m^3)
- XUNIF_WWILT / CFNAM_WWILT / CFTYP_WWILT: wilting point volumetric water content profile (m/s)

NAM_DATA_ISBA				
Parameters for irrigation when LAGRIP or/and LIRRIGMODE are activated				
Name	Type	Values	Default	X-Reference
XUNIF_XUNIF_IRRIGTYPE_C	real	0,1,2,3	0 for non irrigated vegtype 1 (sprinkler) for irrigated vegtypes	
XUNIF_XUNIF_IRRIGFRAC_C	real	[0-1]	0.05	
XUNIF_XUNIF_IRRIGFREQ_C	real			
XUNIF_IRRIGTIME_C	real		28800	
XUNIF_WATSUP_C	real		30	
XUNIF_F2THRESHOLD_C	real	[0-1]		
XUNIF_SEED_M_C	real	[1-12]	3	
XUNIF_SEED_D_C	real	[1-31]	15	
XUNIF_REAP_M_C	real	[1-12]	8	
XUNIF_REAP_D_C	real	[1-31]	31	
XUNIF_SEED_S2_M_C	real	[1-12]		
XUNIF_SEED_S2_D_C	real	[1-31]		
XUNIF_REAP_S2_M_C	real	[1-12]		
XUNIF_REAP_S2_D_C	real	[1-31]		
XUNIF_SEED_S3_M_C	real	[1-12]		
XUNIF_SEED_S3_D_C	real	[1-31]		
XUNIF_REAP_S3_M_C	real	[1-12]		
XUNIF_REAP_S3_D_C	real	[1-31]		
XUNIF_SEED_D_DELTA	real		0	
XUNIF_REAP_D_DELTA	real		0	
XUNIF_SEED_S2_D_DELTA	real		0	
XUNIF_REAP_S2_D_DELTA	real		0	
XUNIF_SEED_S3_D_DELTA	real		0	
Parameters for irrigation depending on number of vegetation types irrigated NVEG_IRR NVEG_IRR=6 by default				
Name	Type	Values	Default	X-Reference
NUNIF_VEG_IRR_USE	integer		(/5,7,12,16,17,18/)	
Parameters for irrigation depending on number of type of irrigation NIRR_TYPE NIRR_TYPE=3 by default in the code				
XUNIF_IRRIGFREQ_CTYPE	integer		(/604800,0,604800/)	
Parameters for irrigation, depending on time only				
Name	Type	Values	Default	X-Reference
XUNIF_WATSUP_CTIME	integer			
XUNIF_F2THRESHOLD_CTIME	integer	[0-1]		

- NUNIF_VEG_IRR_USE: if LAGRIP or/and LIRRIGMODE are activated, corresponds to the number of vegetation types irrigated or/and with agricultural practices. By default if LECOCLIMAP-SG and LIRRIGMODE (with or without LAGRIP), it is (/5,7,12,16,17,18/) (temperate broadleaf deciduous, temperate broadleaf evergreen, shrubs, C3 winter crops, C3 summer crops and C4 crops. And with ECOCLIMAP, it is (/9/), the value of the NVT_IRR vegetation type.
- XUNIF_IRRIGFREQ_CTYPE: values for the 3 types of irrigation respectively sprinkling dripping and flooding (s).
- XUNIF_WATSUP_CTIME: water supply during irrigation process (mm)
- XUNIF_F2THRESHOLD_CTIME: threshold for irrigation triggering
- XUNIF_IRRIGTYPE_C: Type of irrigation (constant value for all irrigated type of vegetation). 0 for none, 1 for sprinkling, 2 for dripping and 3 for flooding.

- XUNIF_IRRIGFRAC_C: Irrigation fraction (constant value for all irrigated type of vegetation).
- XUNIF_IRRIGFREQ_C: minimum time between two irrigation triggers in s (constant value for all irrigated type of vegetation).
- XUNIF_IRRIGTIME_C: duration of irrigation in s (constant value for all irrigated type of vegetation).
- XUNIF_WATSUP_C: water supply during irrigation process in mm (constant value for all irrigated type of vegetation).
- XUNIF_F2THRESHOLD_C: threshold for irrigation triggering (constant value for all irrigated type of vegetation).
- XUNIF_SEED_M_C: seeding month and/or month of the beginning of irrigation (constant value for all irrigated type of vegetation)
- XUNIF_SEED_D_C: seeding day and/or day of the beginning of irrigation (constant value for all irrigated type of vegetation)
- XUNIF_REAP_M_C: reaping month and/or month corresponding 2 weeks after the end of irrigation (constant value for all irrigated type of vegetation)
- XUNIF_REAP_D_C: reaping day and/or day corresponding 2 weeks after the end of irrigation (constant value for all irrigated type of vegetation)
- XUNIF_SEED_S2_M_C: idem for a second season
- XUNIF_SEED_S2_D_C: idem for a second season
- XUNIF_REAP_S2_M_C: idem for a second season
- XUNIF_REAP_S2_D_C: idem for a second season
- XUNIF_SEED_S3_M_C: idem for a third season
- XUNIF_SEED_S3_D_C: idem for a third season
- XUNIF_REAP_S3_M_C: idem for a third season
- XUNIF_REAP_S3_D_C: idem for a third season
- XUNIF_SEED_D_DELTA: if date of irrigation are given with XUNIF the seeding date changes with a random value around the DELTA given here (in days)
- XUNIF_REAP_D_DELTA: if date of irrigation are given with XUNIF the reaping date changes with a random value around the DELTA given here (in days)
- XUNIF_SEED_S2_D_DELTA: idem for a second season (in days)
- XUNIF_REAP_S2_D_DELTA: idem for a second season (in days)
- XUNIF_SEED_S3_D_DELTA: idem for a third season (in days)
- XUNIF_REAP_S3_D_DELTA: oden for a third season (in days)

4.4.8 NAM_DATA_TEB

Over urban areas, all surface parameters have to be specified by the user in namelist NAM_DATA_TEB. But, if LECOCLIMAP = T (NAM_FRAC), only some of them can be specified and the missing parameters are completed with ECOCLIMAP database.

Naming convention: XUNIF_* is to give a constant value for a parameter. CFNAME_* and CFTYP_* to indicate respectively the file name and the type of file for this parameter.

Name	Type	Values	Default	X-Reference
NPAR_ROOF_LAYER	integer		0	
NPAR_WALL_LAYER	integer		0	
CBLD_ATYPE	character(LEN=3)	'MAJ', 'ARI'	'MAJ'	
CCSVFILEARCHI	character(LEN=28)		' '	
CCSVFILECOMPO	character(LEN=28)		' '	
NUNIF_BLDTYPE	integer	[1-10]	none	
CFNAM_BLDTYPE	character(LEN=28)		' '	
CFTYP_BLDTYPE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
NUNIF_IND_BLD_AGE	integer	[1-7]	none	
CFNAM_IND_BLD_AGE	character(LEN=28)		' '	
CFTYP_IND_BLD_AGE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
NUNIF_COL_BLD_AGE	integer	[1-7]	none	
CFNAM_COL_BLD_AGE	character(LEN=28)		' '	
CFTYP_COL_BLD_AGE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
NUNIF_USETYPE	integer	[1-13]	none	
CFNAM_USETYPE	character(LEN=28)		' '	
CFTYP_USETYPE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
NUNIF_P1TERRITORY	integer	[1-19]	none	
CFNAM_P1TERRITORY	character(LEN=28)		' '	
CFTYP_P1TERRITORY	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
NUNIF_PXTERRITORY	integer	[1-19]	none	
CFNAM_PXTERRITORY	character(LEN=28)		' '	
CFTYP_PXTERRITORY	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACIHS	real		1E+20	
CFNAM_FRACIHS	character(LEN=28)		' '	
CFTYP_FRACIHS	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACCHS	real		1E+20	
CFNAM_FRACCHS	character(LEN=28)		' '	
CFTYP_FRACCHS	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACCOM	real		1E+20	
CFNAM_FRACCOM	character(LEN=28)		' '	
CFTYP_FRACCOM	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACTER	real		1E+20	
CFNAM_FRACTER	character(LEN=28)		' '	
CFTYP_FRACTER	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

NAM_DATA_TEB				
Name	Type	Values	Default	X-Reference
XUNIF_FRACIND	real		1E+20	
CFNAM_FRACIND	character(LEN=28)		' '	
CFTYP_FRACIND	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACNHE	real		1E+20	
CFNAM_FRACNHE	character(LEN=28)		' '	
CFTYP_FRACNHE	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACPAV	real		1E+20	
CFNAM_FRACPAV	character(LEN=28)		' '	
CFTYP_FRACPAV	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACMRI	real		1E+20	
CFNAM_FRACMRI	character(LEN=28)		' '	
CFTYP_FRACMRI	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACHRI	real		1E+20	
CFNAM_FRACHRI	character(LEN=28)		' '	
CFTYP_FRACHRI	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRACATB	real		1E+20	
CFNAM_FRACATB	character(LEN=28)		' '	
CFTYP_FRACATB	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FOEQI_MAIS	real		1E+20	
CFNAM_FOEQI_MAIS	character(LEN=28)		' '	
CFTYP_FOEQI_MAIS	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FOEQI_APPT	real		1E+20	
CFNAM_FOEQI_APPT	character(LEN=28)		' '	
CFTYP_FOEQI_APPT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FAEQI_MAIS	real		1E+20	
CFNAM_FAEQI_MAIS	character(LEN=28)		' '	
CFTYP_FAEQI_MAIS	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FAEQI_APPT	real		1E+20	
CFNAM_FAEQI_APPT	character(LEN=28)		' '	
CFTYP_FAEQI_APPT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_CRE_MAIS	real		1E+20	
CFNAM_CRE_MAIS	character(LEN=28)		' '	
CFTYP_CRE_MAIS	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_CRE_APPT	real		1E+20	
CFNAM_CRE_APPT	character(LEN=28)		' '	
CFTYP_CRE_APPT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALB_ROOF	real		none	
CFNAM_ALB_ROOF	character(LEN=28)		' '	
CFTYP_ALB_ROOF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_EMIS_ROOF	real		none	
CFNAM_EMIS_ROOF	character(LEN=28)		' '	
CFTYP_EMIS_ROOF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

NAM_DATA_TEB				
Name	Type	Values	Default	X-Reference
XUNIF_HC_ROOF	real		none	
CFNAM_HC_ROOF	character(LEN=28)		' '	
CFTYP_HC_ROOF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_TC_ROOF	real		none	
CFNAM_TC_ROOF	character(LEN=28)		' '	
CFTYP_TC_ROOF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_D_ROOF	real		none	
CFNAM_D_ROOF	character(LEN=28)		' '	
CFTYP_D_ROOF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALB_ROAD	real		none	
CFNAM_ALB_ROAD	character(LEN=28)		' '	
CFTYP_ALB_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_EMIS_ROAD	real		none	
CFNAM_EMIS_ROAD	character(LEN=28)		' '	
CFTYP_EMIS_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_HC_COATING_ROAD	real		none	
CFNAM_HC_COATING_ROAD	character(LEN=28)		' '	
CFTYP_HC_COATING_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_TC_COATING_ROAD	real		none	
CFNAM_TC_COATING_ROAD	character(LEN=28)		' '	
CFTYP_TC_COATING_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_D_COATING_ROAD	real		none	
CFNAM_D_COATING_ROAD	character(LEN=28)		' '	
CFTYP_D_COATING_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_HC_BASEMENT_ROAD	real		none	
CFNAM_HC_BASEMENT_ROAD	character(LEN=28)		' '	
CFTYP_HC_BASEMENT_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_TC_BASEMENT_ROAD	real		none	
CFNAM_TC_BASEMENT_ROAD	character(LEN=28)		' '	
CFTYP_TC_BASEMENT_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALB_WALL	real		none	
CFNAM_ALB_WALL	character(LEN=28)		' '	
CFTYP_ALB_WALL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_EMIS_WALL	real		none	
CFNAM_EMIS_WALL	character(LEN=28)		' '	
CFTYP_EMIS_WALL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_HC_WALL	real		none	
CFNAM_HC_WALL	character(LEN=28)		' '	
CFTYP_HC_WALL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_TC_WALL	real		none	
CFNAM_TC_WALL	character(LEN=28)		' '	
CFTYP_TC_WALL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

NAM_DATA_TEB				
Name	Type	Values	Default	X-Reference
XUNIF_D_WALL	real		none	
CFNAM_D_WALL	character(LEN=28)		' '	
CFTYP_D_WALL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_Z0_TOWN	real		none	
CFNAM_Z0_TOWN	character(LEN=28)		' '	
CFTYP_Z0_TOWN	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_BLD	real		none	
CFNAM_BLD	character(LEN=28)		' '	
CFTYP_BLD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROAD	real	[0.0,1.0]	none	
CFNAM_ROAD	character(LEN=28)		' '	
CFTYP_ROAD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_BLD_HEIGHT	real		none	
CFNAM_BLD_HEIGHT	character(LEN=28)		' '	
CFTYP_BLD_HEIGHT	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_WALL_O_HOR	real		none	
CFNAM_WALL_O_HOR	character(LEN=28)		' '	
CFTYP_WALL_O_HOR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_H_TRAFFIC	real		none	
CFNAM_H_TRAFFIC	character(LEN=28)		' '	
CFTYP_H_TRAFFIC	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_LE_TRAFFIC	real		none	
CFNAM_LE_TRAFFIC	character(LEN=28)		' '	
CFTYP_LE_TRAFFIC	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_H_INDUSTRY	real		none	
CFNAM_H_INDUSTRY	character(LEN=28)		' '	
CFTYP_H_INDUSTRY	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_LE_INDUSTRY	real		none	
CFNAM_LE_INDUSTRY	character(LEN=28)		' '	
CFTYP_LE_INDUSTRY	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROAD_DIR	real		1.E+20	
CFNAM_ROAD_DIR	character(LEN=28)		' '	
CFTYP_ROAD_DIR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GREENROOF	real		1.E+20	
CFNAM_GREENROOF	character(LEN=28)		' '	
CFTYP_GREENROOF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRAC_HVEG	real		1.E+20	
CFNAM_FRAC_HVEG	character(LEN=28)		' '	
CFTYP_FRAC_HVEG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRAC_LVEG	real		1.E+20	
CFNAM_FRAC_LVEG	character(LEN=28)		' '	
CFTYP_FRAC_LVEG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

NAM_DATA_TEB				
Name	Type	Values	Default	X-Reference
XUNIF_FRAC_NVEG	real		1.E+20	
CFNAM_FRAC_NVEG	character(LEN=28)		' '	
CFTYP_FRAC_NVEG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROUGH_ROOF	real		none	
CFNAM_ROUGH_ROOF	character(LEN=28)		' '	
CFTYP_ROUGH_ROOF	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ROUGH_WALL	real		none	
CFNAM_ROUGH_WALL	character(LEN=28)		' '	
CFTYP_ROUGH_WALL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_EMIS_PANEL	real		1.E+20	
CFNAM_EMIS_PANEL	character(LEN=28)		' '	
CFTYP_EMIS_PANEL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_ALB_PANEL	real		1.E+20	
CFNAM_ALB_PANEL	character(LEN=28)		' '	
CFTYP_ALB_PANEL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_EFF_PANEL	real		1.E+20	
CFNAM_EFF_PANEL	character(LEN=28)		' '	
CFTYP_EFF_PANEL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_FRAC_PANEL	real		1.E+20	
CFNAM_FRAC_PANEL	character(LEN=28)		' '	
CFTYP_FRAC_PANEL	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_NB_POP	real	>0	0.0	
CFNAM_NB_POP	character(LEN=28)		' '	
CFTYP_NB_POP	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_SFCO2_RD	real	>0	0.0	
CFNAM_SFCO2_RD	character(LEN=28)		' '	
CFTYP_SFCO2_RD	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_DELTA_LEGAL_TIME	real		1.E+20	
CFNAM_DELTA_LEGAL_TIME	character(LEN=28)		' '	
CFTYP_DELTA_LEGAL_TIME	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_TIME_OF_CHANGE	real		1.E+20	
XPAR_POP_MONTHLY	real(12)		(/1,1,1,1,1,1, 1,1,1,1, 1,1,1,1/)	
XPAR_POP_DAILY	real(7)		(/1,1,1,1, 1,1,1/) 1,1,1/)	
XPAR_POP_HOURLY	real(24)		(/1,1,1,1, 1,1,1,1, 1,1,1,1, 1,1,1,1, 1,1,1,1/)	

NAM_DATA_TEB				
Name	Type	Values	Default	X-Reference
XPAR_TRAF_MONTHLY	real(12)		(/1,1,1,1,1,1,1,1,1,1,1,1/)	
XPAR_TRAF_DAILY	real(7)		(/1.05,1.07,1.08,1.09,1.15,0.86,0.7/)	
XPAR_TRAF_HOURLY	real(24)		(/(12/33),(12/33),(12/33),(12/33), (12/33),(12/33),(12/33),(48/33), (48/33),(48/33),(48/33),(48/33), (48/33),(48/33),(48/33),(48/33), (48/33),(48/33),(48/33),(48/33), (48/33),(12/33),(12/33),(12/33),	

- NPAR_ROOF_LAYER: number of layers in roofs (-)
- NPAR_WALL_LAYER: number of layers in walls (-)
- CBLD_ATYPE: type of averaging for building (-)
  - 'MAJ': majoritary building in grid mesh is chosen
  - 'ARI': characteristics are linearly averaged
- CCSVFILEARCHI: name of the .csv file containing information on building construction materials. The following parameters can be initialised via the MApUCE architectural tables (CCSVFILEARCHI). Most of these parameters did already exist in previous versions of TEB. In the case one of these parameters is specified via the namelist (XUNIF_...), this entry is prioritised with respect to the entries in the architectural tables. Care is therefore needed during namelist construction.
  - Road properties (ALB_ROAD; EMIS_ROAD; HC_ROAD; TC_ROAD; D_ROAD)
  - Roof properties (ALB_ROOF; EMIS_ROOF; HC_ROOF; TC_ROOF; D_ROOF)
  - Wall properties (ALB_WALL; EMIS_WALL; HC_WALL; TC_WALL; D_WALL)
  - Ground floor properties (HC_FLOOR; TC_FLOOR; D_FLOOR)
  - Thermal mass properties (HC_MASS; TC_MASS; D_MASS)
  - Flag for presence of internal mass (ISMASS)
  - Window properties (GR; U_WIN; SHGC; SHGC_SH
  - Solar panel properties (ALB_PANEL; EMIS_PANEL; EFF_PANEL; FRAC_PANEL)
  - Airtightness (N50)
  - Flag for presence of shading elements (SHADEARCHI)
  - Flag for presence of mechanical ventilation (ISMECH)
  - Air exchange rate due to mechanical ventilation (MECHRATE)
  - Fraction of green roofs (GREENROOF)
- CCSVFILECOMPO: name of the .csv file containing information on human behaviours as a function of building use. The following parameters can be initialised via the MApUCE behavioural table (CCSVFILECOMPO). If one of these parameters is specified via the namelist (XUNIF_...), this entry is prioritised with respect to the entries in the behavioural table. Care is therefore needed during namelist construction.
  - Schedules of building occupation (DAYWBEG_SCHED ; HOURBEG_SCHED)
  - Probability of building occupation (PROBOCC)
  - Holiday periods (BEG_HOLIDAY ; END_HOLIDAY ; MOD_HOLIDAY)
  - Design temperature for heating (THEAT_...)
  - Design temperature and relative humidity for air conditioning (TCOOL_ ; HR_TARGET)
  - Fraction of evaporative air conditioning systems (F_WATER_COND)

  - Fraction of waste heat to the street canyon (F_WASTE_CAN)
  - Rated COP of air conditioning system (COP_RAT)
  - Internal heat release (QIN ; QIN_FRAD ; QIN_FLAT ; MODQIN_VCD ; MODQIN_VLD ; MODQIN_NIG ; HOTWAT)
  - Ventilation (NATVENT ; FVSUM ; FVVAC ; FVNIG ; FOPEN)
  - Shading (FSSUM ; FSVAC ; FSNIG ; WIN_SW_MAX)

- NUNIF_BLDTYPE / CFNAM_BLDTYPE / CFTYP_BLDTYPE: identifier for building type

Identifier of building type						
Identifier	Name	LCZ equivalence		Identifier	Name	LCZ equivalence
1	Detached low-rise	LCZ3, LCZ9		6	Rows of compact mid-rise	LCZ2
2	Semi-detached low-rise	LCZ3, LCZ9		7	Blocks of compact mid-rise	LCZ2
3	Rows of open low-rise	LCZ6		8	Open high-rise	LCZ4
4	Blocks of open low-rise	LCZ6		9	Large low-rise	LCZ8
5	Open mid-rise	LCZ5		10	Informal / Ephemeral building	LCZ7

- NUNIF_IND_BLD_AGE / CFNAM_IND_BLD_AGE / CFTYP_IND_BLD_AGE: identifier for construction period of buildings with individual housing use

- NUNIF_COL_BLD_AGE / CFNAM_COL_BLD_AGE / CFTYP_COL_BLD_AGE: identifier for construction period of buildings (collective housing)

Identifier of building construction period	
Identifier	Time interval
1	$\leq$ 1948
2	1948 - 1973
3	1974-1981
4	1982-1989
5	1990-2000
6	2001-2012
7	$\geq$ 2013

- NUNIF_USETYPE / CFNAM_USETYPE / CFTYP_USETYPE: Identifier for building use

Identifier of building use				
Identifier	Building use		Identifier	Building use
1	agriculture		8	religious
2	castle		9	public health
3	commerce		10	educational
4	collective housing		11	greenhouse
5	individual housing		12	sports facility
6	industrial		13	office
7	non heated			

- NUNIF_P1TERRITORY / CFNAM_P1TERRITORY / CFTYP_P1TERRITORY: Identifier for construction material of historical buildings (before 1948). The P1 territory describes the dominant construction materials for historical buildings (construction period P1). For P1, there is a large variety of materials used for the walls. The identifiers 4 to 19 are related to the P1 territory. (see table below)

- NUNIF_PXTERRITORY / CFNAM_PXTERRITORY / CFTYP_PXTERRITORY: Identifier for construction material of recent buildings (after 1948). The PX territory describes the dominant construction material for the more recent buildings. The identifiers 1 to 3 are related to the PX territory. (see table below)

Identifier of construction material regions			
Identifier	Name	Identifier	Name
1	FRANCE	11	FRANCE_PIERRE_GALET_TUILE
2	FRANCE_BRIQUE	12	FRANCE_PIERRE_MEULIERE_TUILE
3	FRANCE_PIERRE	13	FRANCE_PIERRE_SCHISTE_TUILE
4	FRANCE_PIERRE_CALCAIRE	14	FRANCE_PIERRE_GNEISS_TUILE
5	FRANCE_PIERRE_CALCAIRE_ARDOISE	15	FRANCE_PIERRE_VOLCANIQUE_ARDOISE
6	FRANCE_PIERRE_CALCAIRE_ZINC	16	FRANCE_BOIS_TUILE
7	FRANCE_PIERRE_GRES_TUILE	17	FRANCE_BOIS_ARDOISE
8	FRANCE_PIERRE_GRES_ARDOISE	18	FRANCE_TERRE_TUILE
9	FRANCE_PIERRE_GRANITE_TUILE	19	FRANCE_BRIQUE_TUILE
10	FRANCE_PIERRE_GRANITE_ARDOISE		

- XUNIF_FRACIHS / CFNAM_FRACIHS / CFTYP_FRACIHS: individual housing fraction
- XUNIF_FRACCHS / CFNAM_FRACCHS / CFTYP_FRACCHS: collective housing fraction
- XUNIF_FRACCOM / CFNAM_FRACCOM / CFTYP_FRACCOM: fraction of commercial building use
- XUNIF_FRACTER / CFNAM_FRACTER / CFTYP_FRACTER: fraction of tertiary building use
- XUNIF_FRACIND / CFNAM_FRACIND / CFTYP_FRACIND: fraction of industrial building use
- XUNIF_FRACNHE / CFNAM_FRACNHE / CFTYP_FRACNHE: fraction of non heated buildings
- XUNIF_FRACPAV / CFNAM_FRACPAV / CFTYP_FRACPAV: fraction of low-rise building types
- XUNIF_FRACMRI / CFNAM_FRACMRI / CFTYP_FRACMRI: fraction of mid-rise building types
- XUNIF_FRACHRI / CFNAM_FRACHRI / CFTYP_FRACHRI: fraction of high-rise building types
- XUNIF_FRACATB / CFNAM_FRACATB / CFTYP_FRACATB: fraction of activity buildings
- XUNIF_FOEQI_MAIS / CFNAM_FOEQI_MAIS / CFTYP_FOEQI_MAIS: fraction of strong equipment and use in individual housing (-)
- XUNIF_FOEQI_APPT / CFNAM_FOEQI_APPT / CFTYP_FOEQI_APPT: fraction of strong equipment and use in collective housing (-)
- XUNIF_FAEQI_MAIS / CFNAM_FAEQI_MAIS / CFTYP_FAEQI_MAIS: fraction of weak equipment and use in individual housing (-)
- XUNIF_FAEQI_APPT / CFNAM_FAEQI_APPT / CFTYP_FAEQI_APPT: fraction of weak equipment and use in collective housing (-)
- XUNIF_CRE_MAIS / CFNAM_CRE_MAIS / CFTYP_CRE_MAIS: fraction of high regulation in individual housing (-)
- XUNIF_CRE_APPT / CFNAM_CRE_APPT / CFTYP_CRE_APPT: fraction of high regulation in collective housing (-)
- XUNIF_ALB_ROOF / CFNAM_ALB_ROOF / CFTYP_ALB_ROOF: roof albedo (-)
- XUNIF_EMIS_ROOF / CFNAM_EMIS_ROOF / CFTYP_EMIS_ROOF: roof emissivity (-)
- XUNIF_HC_ROOF / CFNAM_HC_ROOF / CFTYP_HC_ROOF: roof layers heat capacity ($J/K/m^3$)

- XUNIF_TC_ROOF / CFNAM_TC_ROOF / CFTYP_TC_ROOF: roof layers thermal conductivity (W/K/m)
- XUNIF_D_ROOF / CFNAM_D_ROOF / CFTYP_D_ROOF: roof layers depth (m)
- XUNIF_ALB_ROAD / CFNAM_ALB_ROAD / CFTYP_ALB_ROAD: road albedo (-)
- XUNIF_EMIS_ROAD / CFNAM_EMIS_ROAD / CFTYP_EMIS_ROAD: road emissivity (-)
- XUNIF_HC_COATING_ROAD / CFNAM_HC_COATING_ROAD / CFTYP_HC_COATING_ROAD: road coating heat capacity (J/K/m^3)
- XUNIF_TC_COATING_ROAD / CFNAM_TC_COATING_ROAD / CFTYP_TC_COATING_ROAD: road coating thermal conductivity (W/K/m)
- XUNIF_D_COATING_ROAD / CFNAM_D_COATING_ROAD / CFTYP_D_COATING_ROAD: depth of road coating (m)
- XUNIF_HC_BASEMENT_ROAD / CFNAM_HC_BASEMENT_ROAD / CFTYP_HC_BASEMENT_ROAD: road basement heat capacity (J/K/m^3)
- XUNIF_TC_BASEMENT_ROAD / CFNAM_TC_BASEMENT_ROAD / CFTYP_TC_BASEMENT_ROAD: road basement thermal conductivity (W/K/m)
- XUNIF_ALB_WALL / CFNAM_ALB_WALL / CFTYP_ALB_WALL: wall albedo (-)
- XUNIF_EMIS_WALL / CFNAM_EMIS_WALL / CFTYP_EMIS_WALL: wall emissivity (-)
- XUNIF_HC_WALL / CFNAM_HC_WALL / CFTYP_HC_WALL: wall layers heat capacity (J/K/m^3)
- XUNIF_XUNIF_TC_WALL / CFNAM_XUNIF_TC_WALL / CFTYP_XUNIF_TC_WALL: wall layers thermal conductivity (W/K/m)
- XUNIF_D_WALL / CFNAM_D_WALL / CFTYP_D_WALL: wall layers depth (m)
- XUNIF_Z0_TOWN / CFNAM_Z0_TOWN / CFTYP_Z0_TOWN: roughness length for momentum (m)
- XUNIF_BLD / CFNAM_BLD / CFTYP_BLD: fraction of buildings (-)
- XUNIF_ROAD / CFNAM_ROAD / CFTYP_ROAD: fraction of road (-)
- XUNIF_BLD_HEIGHT / CFNAM_BLD_HEIGHT / CFTYP_BLD_HEIGHT: buildings height (m)
- XUNIF_WALL_O_HOR / CFNAM_WALL_O_HOR / CFTYP_WALL_O_HOR : ratio between facade and urban horizontal surface (-)
- XUNIF_H_TRAFFIC / CFNAM_H_TRAFFIC / CFTYP_H_TRAFFIC: anthropogenic sensible heat fluxes due to traffic (W/m^2)
- XUNIF_LE_TRAFFIC / CFNAM_LE_TRAFFIC / CFTYP_LE_TRAFFIC: anthropogenic latent heat fluxes due to traffic (W/m^2)
- XUNIF_H_INDUSTRY / CFNAM_H_INDUSTRY / CFTYP_H_INDUSTRY: anthropogenic sensible heat fluxes due to factories (W/m^2)
- XUNIF_LE_INDUSTRY / CFNAM_LE_INDUSTRY / CFTYP_LE_INDUSTRY: anthropogenic latent heat fluxes due to factories (W/m^2)
- XUNIF_ROAD_DIR / CFNAM_ROAD_DIR / CFTYP_ROAD_DIR: road direction (in degrees from North clockwise)

- XUNIF_GREENROOF / CFNAM_GREENROOF / CFTYP_GREENROOF: fraction of greenroofs on roofs (-)
- XUNIF_FRAC_HVEG / CFNAM_FRAC_HVEG / CFTYP_FRAC_HVEG: fraction of high vegetation (-)
- XUNIF_FRAC_LVEG / CFNAM_FRAC_LVEG / CFTYP_FRAC_LVEG: fraction of low vegetation (-)
- XUNIF_FRAC_NVEG / CFNAM_FRAC_NVEG / CFTYP_FRAC_NVEG: fraction of bare soil (-)
- XUNIF_ROUGH_ROOF / CFNAM_ROUGH_ROOF / CFTYP_ROUGH_ROOF: roof roughness coefficient
- XUNIF_ROUGH_WALL / CFNAM_ROUGH_WALL / CFTYP_ROUGH_WALL: wall roughness coefficient
- XUNIF_EMIS_PANEL / CFNAM_EMIS_PANEL / CFTYP_EMIS_PANEL: emissivity of solar panel
- XUNIF_ALB_PANEL / CFNAM_ALB_PANEL / CFTYP_ALB_PANEL: albedo of solar panel
- XUNIF_EFF_PANEL / CFNAM_EFF_PANEL / CFTYP_EFF_PANEL: efficiency of solar panel
- XUNIF_FRAC_PANEL / CFNAM_FRAC_PANEL / CFTYP_FRAC_PANEL: fraction of solar panel
- XUNIF_NB_POP / CFNAM_NB_POP / CFTYP_NB_POP: population density ($1/km^2$)
- XUNIF_SFCO2_RD / CFNAM_SFCO2_RD / CFTYP_SFCO2_RD : CO_2 flux due to traffic ($kg/s/m^2$)
- XUNIF_DELTA_LEGAL_TIME / CFNAM_DELTA_LEGAL_TIME / CFTYP_DELTA_LEGAL_TIME: difference between UTC and legal time (hours)
- XUNIF_TIME_OF_CHANGE: time of time change of the legal hour
- XUNIF_POP_MONTHLY: monthly cycle of inhabitants density
- XUNIF_POP_DAILY: daily cycle of inhabitants density
- XUNIF_POP_HOURLY: hourly cycle of inhabitants density
- XUNIF_TRAF_MONTHLY: monthly cycle of traffic
- XUNIF_TRAF_DAILY: daily cycle of traffic
- XUNIF_TRAF_HOURLY: hourly cycle of traffic

4.4.9 NAM_DATA_TEB_IRRIG

If one is given for GARDEN, GREENROOF or ROAD, all must be given for this cover type.
Naming convention: XUNIF_* is to give a constant value for a parameter. CFNAME_* and CFTYP_* to indicate respectively the file name and the type of file for this parameter.

Name	Type	Values	Default	X-Reference
XUNIF_GD_START_MONTH	real		1.E+20	
CFNAM_GD_START_MONTH	character(LEN=28)		' '	
CFTYP_GD_START_MONTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GD_END_MONTH	real		1.E+20	
CFNAM_GD_END_MONTH	character(LEN=28)		' '	
CFTYP_GD_END_MONTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GD_START_HOUR	real		1.E+20	
CFNAM_GD_START_HOUR	character(LEN=28)		' '	
CFTYP_GD_START_HOUR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GD_END_HOUR	real		1.E+20	
CFNAM_GD_END_HOUR	character(LEN=28)		' '	
CFTYP_GD_END_HOUR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GD_24H_IRRIG	real		1.E+20	
CFNAM_GD_24H_IRRIG	character(LEN=28)		' '	
CFTYP_GD_24H_IRRIG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GR_START_MONTH	real		1.E+20	
CFNAM_GR_START_MONTH	character(LEN=28)		' '	
CFTYP_GR_START_MONTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GR_END_MONTH	real		1.E+20	
CFNAM_GR_END_MONTH	character(LEN=28)		' '	
CFTYP_GR_END_MONTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GR_START_HOUR	real		1.E+20	
CFNAM_GR_START_HOUR	character(LEN=28)		' '	
CFTYP_GR_START_HOUR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GR_END_HOUR	real		1.E+20	
CFNAM_GR_END_HOUR	character(LEN=28)		' '	
CFTYP_GR_END_HOUR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_GR_24H_IRRIG	real		1.E+20	
CFNAM_GR_24H_IRRIG	character(LEN=28)		' '	
CFTYP_GR_24H_IRRIG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_RD_START_MONTH	real		1.E+20	
CFNAM_RD_START_MONTH	character(LEN=28)		' '	
CFTYP_RD_START_MONTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_RD_END_MONTH	real		1.E+20	
CFNAM_RD_END_MONTH	character(LEN=28)		' '	
CFTYP_RD_END_MONTH	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_RD_START_HOUR	real		1.E+20	
CFNAM_RD_START_HOUR	character(LEN=28)		' '	
CFTYP_RD_START_HOUR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

NAM_DATA_TEB_IRRIG				
Name	Type	Values	Default	X-Reference
XUNIF_RD_END_HOUR	real		1.E+20	
CFNAM_RD_END_HOUR	character(LEN=28)		' '	
CFTYP_RD_END_HOUR	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	
XUNIF_RD_24H_IRRIG	real		1.E+20	
CFNAM_RD_24H_IRRIG	character(LEN=28)		' '	
CFTYP_RD_24H_IRRIG	character(LEN=6)	'DIRECT', 'BINLLF' 'BINLLV', 'ASCLLV'	none	

- XUNIF_GD_START_MONTH / CFNAM_GD_START_MONTH / CFTYP_GD_START_MONTH: start month for irrigation for gardens (included)
- XUNIF_GD_END_MONTH / CFNAM_GD_END_MONTH / CFTYP_GD_END_MONTH: end month for irrigation for gardens (included)
- XUNIF_GD_START_HOUR / CFNAM_GD_START_HOUR / CFTYP_GD_START_HOUR: start solar hour for irrigation for gardens (included)
- XUNIF_GD_END_HOUR / CFNAM_GD_END_HOUR / CFTYP_GD_END_HOUR: end solar hour for irrigation for gardens (excluded)
- XUNIF_GD_24H_IRRIG / CFNAM_GD_24H_IRRIG / CFTYP_GD_24H_IRRIG: total irrigation over 24 hours for gardens (kg/m^2)
- XUNIF_GR_START_MONTH / CFNAM_GR_START_MONTH / CFTYP_GR_START_MONTH: start month for irrigation for greenroofs (included)
- XUNIF_GR_END_MONTH / CFNAM_GR_END_MONTH / CFTYP_GR_END_MONTH: end month for irrigation for greenroofs (included)
- XUNIF_GR_START_HOUR / CFNAM_GR_START_HOUR / CFTYP_GR_START_HOUR: start solar hour for irrigation for greenroofs (included)
- XUNIF_GR_END_HOUR / CFNAM_GR_END_HOUR / CFTYP_GR_END_HOUR: end solar hour for irrigation for greenroofs (excluded)
- XUNIF_GR_24H_IRRIG / CFNAM_GR_24H_IRRIG / CFTYP_GR_24H_IRRIG: total irrigation over 24 hours for greenroofs (kg/m^2)
- XUNIF_RD_START_MONTH / CFNAM_RD_START_MONTH / CFTYP_RD_START_MONTH: start month for irrigation for roads (included)
- XUNIF_RD_END_MONTH / CFNAM_RD_END_MONTH / CFTYP_RD_END_MONTH: end month for irrigation for roads (included)
- XUNIF_RD_START_HOUR / CFNAM_RD_START_HOUR / CFTYP_RD_START_HOUR: start solar hour for irrigation forroads (included)
- XUNIF_RD_END_HOUR / CFNAM_RD_END_HOUR / CFTYP_RD_END_HOUR: end solar hour for irrigation for roads (excluded)
- XUNIF_RD_24H_IRRIG / CFNAM_RD_24H_IRRIG / CFTYP_RD_24H_IRRIG: total irrigation over 24 hours for roads (kg/m^2)

4.4.10 NAM_DATA_TEB_GARDEN

Over urban areas, if ECOCLIMAP is not used, all vegetation surface parameters have to be specified by the user in namelist NAM_DATA_TEB_GARDEN.
Naming convention: XUNIF_* is to give a constant value for a parameter. CFNAME_* and CFTYP_* to indicate respectively the file name and the type of file for this parameter.

Name	Type	Values	Default	X-Reference
NTIME_GD	integer	1, 12	12	
CTYP_GARDEN_HVEG	character(LEN=4)	'BOBD', 'TEBD', 'TRBD', 'TEBE', 'TRBE', 'BONE', 'TENE', 'BOND', 'SHRB', 'FLTR'	'TEBD'	
CTYP_GARDEN_LVEG	character(LEN=4)	'BOGR', 'GRAS', 'TROG', 'C3W', 'C3S', 'C4', 'FLGR', 'C3', 'PARK'	'GRAS'	
CTYP_GARDEN_NVEG	character(LEN=4)	'NO', 'ROCK', 'SNOW'	'NO'	
CSHAPE_GARDEN_NVEG	character(LEN=3)	'CYL'	'CYL'	
XUNIF_LAI_HVEG	real		1.E+20	
CFNAM_LAI_HVEG	character(LEN=28)		' '	
CFTYP_LAI_HVEG	character(LEN=28)	'DIRECT','ASCLLV' 'BINLLV','BINLLF'	' '	
XUNIF_LAI_LVEG	real		1.E+20	
CFNAM_LAI_LVEG	character(LEN=28)		' '	
CFTYP_LAI_LVEG	character(LEN=28)	'DIRECT','ASCLLV' 'BINLLV','BINLLF'	' '	
XUNIF_H_HVEG	real		1.E+20	
CFNAM_H_HVEG	character(LEN=28)		' '	
CFTYP_H_HVEG	character(LEN=28)	'DIRECT','ASCLLV' 'BINLLV','BINLLF'	' '	
XUNIF_HTRUNK_HVEG	real	>0	3.0	
CFNAM_HTRUNK_HVEG	character(LEN=28)		' '	
CFTYP_HTRUNK_HVEG	character(LEN=28)	'DIRECT','ASCLLV' 'BINLLV','BINLLF'	' '	
XUNIF_WCROWN_HVEG	real	>0	5.0	
CFNAM_WCROWN_HVEG	character(LEN=28)		' '	
CFTYP_WCROWN_HVEG	character(LEN=28)	'DIRECT','ASCLLV' 'BINLLV','BINLLF'	' '	
XUNIF_RE25	real	>0	1E+20	
CFNAM_RE25	character(LEN=28)		' '	
CFTYP_RE25	character(LEN=28)	'DIRECT','ASCLLV' 'BINLLV','BINLLF'	' '	

- NTIME_GD: time dimension
- CTYP_GARDEN_HVEG: type of high vegetation
- CTYP_GARDEN_LVEG: type of low vegetation
- CTYP_GARDEN_NVEG: type of bare soil
- CSHAPE_GARDEN_NVEG: shape of crown for urban trees. For the moment, only cylindric shape of crown 'CYL'is available.
- XUNIF_LAI_HVEG / CFNAM_LAI_HVEG / CFTYP_LAI_HVEG: LAI of high vegetation (m^2/m^2)
- XUNIF_LAI_LVEG / CFNAM_LAI_LVEG / CFTYP_LAI_LVEG: LAI of low vegetation (m^2/m^2)

- XUNIF_H_HVEG / CFNAM_H_HVEG / CFTYP_H_HVEG: height of trees (m)
- XUNIF_HTRUNK_HVEG / CFNAM_HTRUNK_HVEG / CFTYP_HTRUNK_HVEG: height of trunk of trees (m)
- XUNIF_WCROWN_HVEG / CFNAM_WCROWN_HVEG / CFTYP_WCROWN_HVEG: width of crown of trees (m)
- XUNIF_RE25 / CFNAM_RE25 / CFTYP_RE25 : ecosystem respiration parameter (kg/m^2/s)

4.4.11 NAM_DATA_BEM

Naming convention: XUNIF_* is to give a constant value for a parameter. CFNAME_* and CFTYP_* to indicate respectively the file name and the type of file for this parameter.

Name	Type	Values	Default	X-Reference
NPAR_FLOOR_LAYER	integer		1	
NPAR_MASS_LAYER	integer	≤9	1	
XPAR_CF_CO2_ELEC	real		0.0	
XPAR_CF_CO2_GAS	real		57E-9	
XPAR_CF_CO2_FUEL	real		75E-9	
XPAR_CF_CO2_OTHER	real		92E-9	
XUNIF_HC_FLOOR	real		none	
CFNAM_HC_FLOOR	character(LEN=28)		”	
CFTYP_HC_FLOOR	character(LEN=6)	’DIRECT’, ’BINLLF’ ’BINLLV’, ’ASCLLV’	”	
XUNIF_TC_FLOOR	real		none	
CFNAM_TC_FLOOR	character(LEN=28)		”	
CFTYP_TC_FLOOR	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_D_FLOOR	real		none	
CFNAM_D_FLOOR	character(LEN=28)		”	
CFTYP_D_FLOOR	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_HC_MASS	real		2.016E+6	
CFNAM_HC_MASS	character(LEN=28)		”	
CFTYP_HC_MASS	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_TC_MASS	real		1.95	
CFNAM_TC_MASS	character(LEN=28)		”	
CFTYP_TC_MASS	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_D_MASS	real		0.12	
CFNAM_D_MASS	character(LEN=28)		”	
CFTYP_D_MASS	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_FLOOR_HEIGHT	real		none	
CFNAM_FLOOR_HEIGHT	character(LEN=28)		”	
CFTYP_FLOOR_HEIGHT	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_F_WASTE_CAN	real		none	
CFNAM_F_WASTE_CAN	character(LEN=28)		”	
CFTYP_F_WASTE_CAN	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_F_WATER_COND	real		none	
CFNAM_F_WATER_COND	character(LEN=28)		”	
CFTYP_F_WATER_COND	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	

NAM_DATA_BEM				
Name	Type	Values	Default	X-Reference
XUNIF_DCS_AREA	real		1E+20	
CFNAM_DCS_AREA	character(LEN=28)		”	
CFTYP_DCS_AREA	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_HR_TARGET	real		none	
CFNAM_HR_TARGET	character(LEN=28)		”	
CFTYP_HR_TARGET	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_QIN	real(NBEMCOMP)		5.8	
CFNAM_QIN	character(LEN=28)		”	
CFTYP_QIN	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_QIN_FRAD	real		0.2	
CFNAM_QIN_FRAD	character(LEN=28)		”	
CFTYP_QIN_FRAD	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_QIN_FLAT	real		0.0	
CFNAM_QIN_FLAT	character(LEN=28)		”	
CFTYP_QIN_FLAT	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	”	
XUNIF_MODQIN_VCD	real(NBEMCOMP)		1.0	
CFNAM_MODQIN_VCD	character(LEN=28)		’ ’	
CFTYP_MODQIN_VCD	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_MODQIN_VLD	real(NBEMCOMP)		1.0	
CFNAM_MODQIN_VLD	character(LEN=28)		’ ’	
CFTYP_MODQIN_VLD	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_MODQIN_NIG	real(NBEMCOMP)		1.0	
CFNAM_MODQIN_NIG	character(LEN=28)		’ ’	
CFTYP_MODQIN_NIG	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_SHGC	real		none	
CFNAM_SHGC	character(LEN=28)		’ ’	
CFTYP_SHGC	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_U_WIN	real		none	
CFNAM_U_WIN	character(LEN=28)		’ ’	
CFTYP_U_WIN	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_GR	real		none	
CFNAM_GR	character(LEN=28)		’ ’	
CFTYP_GR	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_SHGC_SH	real		none	
CFNAM_SHGC_SH	character(LEN=28)		’ ’	
CFTYP_SHGC_SH	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_N50	real		8.0	
CFNAM_N50	character(LEN=28)		’ ’	
CFTYP_N50	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	
XUNIF_CAP_SYS_HEAT	real		none	
CFNAM_CAP_SYS_HEAT	character(LEN=28)		’ ’	
CFTYP_CAP_SYS_HEAT	character(LEN=6)	’DIRECT’, ’BINLLF’, ’BINLLV’, ’ASCLLV’	’ ’	

NAM_DATA_BEM				
Name	Type	Values	Default	X-Reference
XUNIF_CAP_SYS_RAT	real		none	
CFNAM_CAP_SYS_RAT	character(LEN=28)		' '	
CFTYP_CAP_SYS_RAT	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_T_ADP	real		none	
CFNAM_T_ADP	character(LEN=28)		' '	
CFTYP_T_ADP	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_M_SYS_RAT	real		none	
CFNAM_M_SYS_RAT	character(LEN=28)		' '	
CFTYP_M_SYS_RAT	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_COP_RAT	real		none	
CFNAM_COP_RAT	character(LEN=28)		' '	
CFTYP_COP_RAT	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_COP_DCS	real		1E+20	
CFNAM_COP_DCS	character(LEN=28)		' '	
CFTYP_COP_DCS	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_T_SIZE_MAX	real		none	
CFNAM_T_SIZE_MAX	character(LEN=28)		"	
CFTYP_T_SIZE_MAX	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	"	
XUNIF_T_SIZE_MIN	real		none	
CFNAM_T_SIZE_MIN	character(LEN=28)		"	
CFTYP_T_SIZE_MIN	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	"	
XUNIF_ISMECH	real	0 (NO) / 1 (YES)	0.0	
CFNAM_ISMECH	character(LEN=28)		' '	
CFTYP_ISMECH	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_MECHRATE	real	0 (NO) / 1 (YES)	0.0	
CFNAM_MECHRATE	character(LEN=28)		' '	
CFTYP_MECHRATE	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_SHADEARCHI	real	0, 1, 2	0.0	
CFNAM_SHADEARCHI	character(LEN=28)		' '	
CFTYP_SHADEARCHI	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_NATVENT	real(NBEMCOMP)	0,1,2	0	
CFNAM_NATVENT	character(LEN=28)		' '	
CFTYP_NATVENT	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FRACOMP	real(NBEMCOMP)		1.0	
CFNAM_FRACOMP	character(LEN=28)		' '	
CFTYP_FRACOMP	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_RESIDENTIAL	real		1.0	
CFNAM_RESIDENTIAL	character(LEN=28)		' '	
CFTYP_RESIDENTIAL	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	

NAM_DATA_BEM				
Name	Type	Values	Default	X-Reference
XUNIF_TDESV	real		295.16	
CFNAM_TDESV	character(LEN=28)		' '	
CFTYP_TDESV	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_WIN_SW_MAX	real		150.0	
CFNAM_WIN_SW_MAX	character(LEN=28)		' '	
CFTYP_WIN_SW_MAX	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FOPEN	real		0.0	
CFNAM_FOPEN	character(LEN=28)		' '	
CFTYP_FOPEN	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FVSUM	real(NBEMCOMP)		0.0	
CFNAM_FVSUM	character(LEN=28)		' '	
CFTYP_FVSUM	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FVVAC	real(NBEMCOMP)		0.0	
CFNAM_FVVAC	character(LEN=28)		' '	
CFTYP_FVVAC	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FVNIG	real(NBEMCOMP)		0.0	
CFNAM_FVNIG	character(LEN=28)		' '	
CFTYP_FVNIG	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FSSUM	real(NBEMCOMP)		0.0	
CFNAM_FSSUM	character(LEN=28)		' '	
CFTYP_FSSUM	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FSVAC	real(NBEMCOMP)		0.0	
CFNAM_FSVAC	character(LEN=28)		' '	
CFTYP_FSVAC	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FSNIG	real(NBEMCOMP)		0.0	
CFNAM_FSNIG	character(LEN=28)		' '	
CFTYP_FSNIG	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_DAYWBEG_SCHED	real(3,NBEMCOMP)	[1,7]	(/1,6,7/)	
CFNAM_DAYWBEG_SCHED	character(LEN=28)		' '	
CFTYP_DAYWBEG_SCHED	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_HOURWBEG_SCHED	real(4*3,NBEMCOMP)		(/5,7,16,23/)	
CFNAM_HOURWBEG_SCHED	character(LEN=28)		' '	
CFTYP_HOURWBEG_SCHED	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_PROBOCC	real(4*3,NBEMCOMP)		1.0	
CFNAM_PROBOCC	character(LEN=28)		' '	
CFTYP_PROBOCC	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_BEG_HOLIDAY	real(1,NBEMCOMP)		400.	
CFNAM_BEG_HOLIDAY	character(LEN=28)		' '	
CFTYP_BEG_HOLIDAY	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_END_HOLIDAY	real(1,NBEMCOMP)		400.	
CFNAM_END_HOLIDAY	character(LEN=28)		' '	
CFTYP_END_HOLIDAY	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	

NAM_DATA_BEM				
Name	Type	Values	Default	X-Reference
XUNIF_MOD_HOLIDAY	real		1.0	
CFNAM_MOD_HOLIDAY	character(LEN=28)		' '	
CFTYP_MOD_HOLIDAY	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_TCOOL_OCCD	real(NBEMCOMP)		300.16	
CFNAM_TCOOL_OCCD	character(LEN=28)		' '	
CFTYP_TCOOL_OCCD	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_TCOOL_OCCN	real(NBEMCOMP)		300.16	
CFNAM_TCOOL_OCCN	character(LEN=28)		' '	
CFTYP_TCOOL_OCCN	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_TCOOL_VCDD	real(NBEMCOMP)		300.16	
CFNAM_TCOOL_VCDD	character(LEN=28)		' '	
CFTYP_TCOOL_VCDD	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_TCOOL_VCDN	real(NBEMCOMP)		300.16	
CFNAM_TCOOL_VCDN	character(LEN=28)		' '	
CFTYP_TCOOL_VCDN	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_TCOOL_VCLD	real(NBEMCOMP)		300.16	
CFNAM_TCOOL_VCLD	character(LEN=28)		' '	
CFTYP_TCOOL_VCLD	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_THEAT_OCCD	real(NBEMCOMP)		293.16	
CFNAM_THEAT_OCCD	character(LEN=28)		' '	
CFTYP_THEAT_OCCD	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_THEAT_OCCN	real(NBEMCOMP)		293.16	
CFNAM_THEAT_OCCN	character(LEN=28)		' '	
CFTYP_THEAT_OCCN	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_THEAT_VCDD	real(NBEMCOMP)		293.16	
CFNAM_THEAT_VCDD	character(LEN=28)		' '	
CFTYP_THEAT_VCDD	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_THEAT_VCDN	real(NBEMCOMP)		293.16	
CFNAM_THEAT_VCDN	character(LEN=28)		' '	
CFTYP_THEAT_VCDN	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_THEAT_VCLD	real(NBEMCOMP)		293.16	
CFNAM_THEAT_VCLD	character(LEN=28)		' '	
CFTYP_THEAT_VCLD	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FRAC_HEAT_ELEC	real(NBEMCOMP)		0.5	
CFNAM_FRAC_HEAT_ELEC	character(LEN=28)		' '	
CFTYP_FRAC_HEAT_ELEC	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FRAC_HEAT_GAS	real(NBEMCOMP)		0.25	
CFNAM_FRAC_HEAT_GAS	character(LEN=28)		' '	
CFTYP_FRAC_HEAT_GAS	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_FRAC_HEAT_FUEL	real(NBEMCOMP)		0.25	
CFNAM_FRAC_HEAT_FUEL	character(LEN=28)		' '	
CFTYP_FRAC_HEAT_FUEL	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	

NAM_DATA_BEM				
Name	Type	Values	Default	X-Reference
XUNIF_FRAC_HEAT_OTHER	real(NBEMCOMP)		0.0	
CFNAM_FRAC_HEAT_OTHER	character(LEN=28)		' '	
CFTYP_FRAC_HEAT_OTHER	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_HOTWAT	real(NBEMCOMP)		0.0	
CFNAM_HOTWAT	character(LEN=28)		' '	
CFTYP_HOTWAT	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	
XUNIF_F_HW_GAS	real		0.0	
CFNAM_F_HW_GAS	character(LEN=28)		' '	
CFTYP_F_HW_GAS	character(LEN=6)	'DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV'	' '	

- NPAR_FLOOR_LAYER: number of layers in roofs
- NPAR_MASS_LAYER: number of layers for the internal mass in input data. This does NOT refer to the computational grid. The mass properties are interpolated from the input grid to the computational grid.
- XPAR_CF_CO2_ELEC: Emission factor CO_2/electricity ($KgCO_2.J^{-1}$)
- XPAR_CF_CO2_GAS: Emission factor CO_2/gas ($KgCO_2.J^{-1}$)
- XPAR_CF_CO2_FUEL: Emission factor CO_2/fuel ($KgCO_2.J^{-1}$)
- XPAR_CF_CO2_OTHER: Emission factor CO_2/other sources. The defaults emission factor assumes wood. ($KgCO_2.J^{-1}$)
- XUNIF_HC_FLOOR / CFNAM_HC_FLOOR / CFTYP_HC_FLOOR: heat capacity of floor layers (J m^{-3} K^{-1})
- XUNIF_TC_FLOOR / CFNAM_TC_FLOOR / CFTYP_TC_FLOOR: thermal conductivity of floor layers (W m^{-1} K^{-1})
- XUNIF_D_FLOOR / CFNAM_D_FLOOR / CFTYP_D_FLOOR: thickness of floor layers (m)
- XUNIF_HC_MASS / CFNAM_HC_MASS / CFTYP_HC_MASS: heat capacity of up to 9 mass layers ($J/K/m^3$)
- XUNIF_TC_MASS / CFNAM_TC_MASS / CFTYP_TC_MASS: thermal conductivity of up to 9 mass layers (W/m/K)
- XUNIF_D_MASS / CFNAM_D_MASS / CFTYP_D_MASS: depth of up to 9 mass layers (m)
- XUNIF_FLOOR_HEIGHT / CFNAM_FLOOR_HEIGHT / CFTYP_FLOOR_HEIGHT: building floor height (m)
- XUNIF_F_WASTE_CAN / CFNAM_F_WASTE_CAN / CFTYP_F_WASTE_CAN: fraction of waste heat into the canyon
- XUNIF_F_WATER_COND / CFNAM_F_WATER_COND / CFTYP_F_WATER_COND: fraction of evaporation for condensers
- XUNIF_DCS_AREA / CFNAM_DCS_AREA / CFTYP_DCS_AREA: presence of district cooling system
- XUNIF_HR_TARGET / CFNAM_HR_TARGET / CFTYP_HR_TARGET: relative humidity setpoint

- XUNIF_QIN / CFNAM_QIN / CFTYP_QIN: internal heat release (W m^{-2}). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_QIN_FRAD / CFNAM_QIN_FRAD / CFTYP_QIN_FRAD: radiant fraction of internal heat gains
- XUNIF_QIN_FLAT / CFNAM_QIN_FLAT / CFTYP_QIN_FLAT: latent fraction of internal heat gains
- XUNIF_MODQIN_VCD / CFNAM_MODQIN_VCD / CFTYP_MODQIN_VCD: Modulation factor for internal heat release when the building is vacant for short duration. This value can be specified for up to 9 tiles of use/behaviour (NBEMCOMP)
- XUNIF_MODQIN_VLD / CFNAM_MODQIN_VLD / CFTYP_MODQIN_VLD: Modulation factor for internal heat release when the building is vacant for long duration (e.g. holidays). Can be specified for up to 9 tiles of use/behaviour (NBEMCOMP)
- XUNIF_MODQIN_NIG / CFNAM_MODQIN_NIG / CFTYP_MODQIN_NIG: Modulation factor for internal heat release during the night. This value can be specified for up to 9 tiles of use/behaviour (NBEMCOMP)
- XUNIF_SHGC / CFNAM_SHGC / CFTYP_SHGC: solar transmitance of windows (1)
- XUNIF_U_WIN / CFNAM_U_WIN / CFTYP_U_WIN: U-Value of window (W.m^{-2}.K^{-1})
- XUNIF_GR / CFNAM_GR / CFTYP_GR: glazing ratio (1)
- XUNIF_SHGC_SH / CFNAM_SHGC_SH / CFTYP_SHGC_SH: solar transmitance of windows + shading
- XUNIF_N50 / CFNAM_N50 / CFTYP_N50: Airtightness of the building (vol/h at 5O Pa)
- XUNIF_CAP_SYS_HEAT / CFNAM_CAP_SYS_HEAT / CFTYP_CAP_SYS_HEAT: capacity of the heating system (W.m^{-2})
- XUNIF_CAP_SYS_RAT / CFNAM_CAP_SYS_RAT / CFTYP_CAP_SYS_RAT: rated capacity of the cooling system (W.m^{-2})
- XUNIF_T_ADP / CFNAM_T_ADP / CFTYP_T_ADP: Apparatus dewpoint temperature of the cooling coil (K)
- XUNIF_M_SYS_RAT / CFNAM_M_SYS_RAT / CFTYP_M_SYS_RAT: rated HVAC mass flow rate (kg.s^{-1}.m^{-2})
- XUNIF_COP_RAT / CFNAM_COP_RAT / CFTYP_COP_RAT: rated COP of the cooling system (1)
- XUNIF_COP_DCS / CFNAM_COP_DCS / CFTYP_COP_DCS: rated COP of the district cooling system (1)
- XUNIF_T_SIZE_MAX / CFNAM_T_SIZE_MAX / CFTYP_T_SIZE_MAX: Temperature for capacity of the cooling system (K)
- XUNIF_T_SIZE_MIN / CFNAM_T_SIZE_MIN / CFTYP_T_SIZE_MIN: Temperature for capacity of the heating system (K)
- XUNIF_ISMECH / CFNAM_ISMECH / CFTYP_ISMECH: control variable for presence of mechanical ventilation (0=no mechanical ventilation / 1=mechanical ventilation)
- XUNIF_MECHRATE / CFNAM_MECHRATE / CFTYP_MECHRATE: air exchange due to mechanical ventilation (vol/h). Replace old key XUNIF_V_VENT. 0=

- XUNIF_SHADEARCHI / CFNAM_SHADEARCHI / CFTYP_SHADEARCHI: presence of shading devices. 0=no / 1=adjustable / 2=permanent
- XUNIF_NATVENT / CFNAM_NATVENT / CFTYP_NATVENT: Control variable for ventilation for up to 9 behaviours in building. 0=No ventilation / 1=Manual ventilation / 2=Automatic ventilation
- XUNIF_FRACOMP / CFNAM_FRACOMP / CFTYP_FRACOMP :fractions of up to 9 tiles of building use/human behaviour. Sum of the fractions must equal 1.
- XUNIF_RESIDENTIAL / CFNAM_RESIDENTIAL / CFTYP_RESIDENTIAL: residential fractions (only used for solar panel)
- XUNIF_TDESV / CFNAM_TDESV / CFTYP_TDESV: Design temperature for ventilation. Indoor air temperature, people or automatic ventilation try to achieve by opening/closing of windows (K)
- XUNIF_WIN_SW_MAX / CFNAM_WIN_SW_MAX / CFTYP_WIN_SW_MAX: threshold for shortwave radiation received by walls used for shading calculations (W/m^2)
- XUNIF_FOPEN / CFNAM_FOPEN / CFTYP_FOPEN: maximum fraction of windows opened in case ventilation is made
- XUNIF_FVSUM / CFNAM_FVSUM / CFTYP_FVSUM: fraction of households using natural ventilation when the building during summer (warm conditions). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_FVVAC / CFNAM_FVVAC / CFTYP_FVVAC: fraction of households using natural ventilation when the building is vacant. This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_FVNIG / CFNAM_FVNIG / CFTYP_FVNIG: fraction of households using natural ventilation during the night. This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_FSSUM / CFNAM_FSSUM / CFTYP_FSSUM: fraction of households closing shading elements during summer (warm conditions). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_FSVAC / CFNAM_FSVAC / CFTYP_FSVAC: fraction of households closing shading elements when the building is vacant. This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_FSNIG / CFNAM_FSNIG / CFTYP_FSNIG: fraction of households closing shading elements duting the night. This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_DAYWBEG_SCHED / CFNAM_DAYWBEG_SCHED / CFTYP_DAYWBEG_SCHED: day of the week for schedules on human behaviour. 1=Monday, 2=Tuesday, ..., 7=Sunday. 3 periods can be specified (by default 1,6,7 = Monday to Friday, Saturday, Sunday) for up to 9 tiles of human behaviour.
- XUNIF_HOURWBEG_SCHED / CFNAM_HOURWBEG_SCHED / CFTYP_HOURWBEG_SCHED: Hour of the day [solar time] for schedules of human behaviour.For each of the 3 day-of-week periods, 4 periods can be specified (e.g. 6 h to 8 h; 8 h to 18 h; 18 h to 22 h; 22 h to 6 h). The last entry for the 'night' period.
- XUNIF_PROBOCC / CFNAM_PROBOCC / CFTYP_PROBOCC: Probability that the building is occupied for the schedules defined by DAYWBEG_SCHED and HOURBEG_SCHED
- XUNIF_BEG_HOLIDAY / CFNAM_BEG_HOLIDAY / CFTYP_BEG_HOLIDAY: Julian day of year of the beginning of holiday period. One holiday period can be specified for up to 9 tiles for human behaviour.

- XUNIF_END_HOLIDAY / CFNAM_END_HOLIDAY / CFTYP_END_HOLIDAY: Julian day of year of the end of holiday period. One holiday period can be specified for up to 9 tiles for human behaviour.
- XUNIF_MOD_HOLIDAY / CFNAM_MOD_HOLIDAY / CFTYP_MOD_HOLIDAY: Modulation factor for internal heat release during holiday period.
- XUNIF_TCOOL_OCCD / CFNAM_TCOOL_OCCD / CFTYP_TCOOL_OCCD: Design temperature for air conditioning when the building is occupied during the day (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_TCOOL_OCCN / CFNAM_TCOOL_OCCN / CFTYP_TCOOL_OCCN: Design temperature for air conditioning when the building is occupied during the night (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_TCOOL_VCDD / CFNAM_TCOOL_VCDD / CFTYP_TCOOL_VCDD: Design temperature for air conditioning when the building is vacant during the day (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_TCOOL_VCDN / CFNAM_TCOOL_VCDN / CFTYP_TCOOL_VCDN: Design temperature for air conditioning when the building is vacant during the night (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_TCOOL_VCLD / CFNAM_TCOOL_VCLD / CFTYP_TCOOL_VCLD: Design temperature for air conditioning when the building is vacant for long duration (K). Example : holiday home. This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_THEAT_OCCD / CFNAM_THEAT_OCCD / CFTYP_THEAT_OCCD: Design temperature for heating when the building is occupied during the day (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_THEAT_OCCN / CFNAM_THEAT_OCCN / CFTYP_THEAT_OCCN: Design temperature for heating when the building is occupied during the night (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_THEAT_VCDD / CFNAM_THEAT_VCDD / CFTYP_THEAT_VCDD: Design temperature for heating when the building is vacant During the Day (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_THEAT_VCDN / CFNAM_THEAT_VCDN / CFTYP_THEAT_VCDN: Design temperature for heating when the building is vacant During the Night (K). This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_THEAT_VCLD / CFNAM_THEAT_VCLD / CFTYP_THEAT_VCLD: Design temperature for heating when the building is vacant for Long Duration (K). Example : holiday home. This value can be specified for up to 9 tiles of use/behaviour.
- XUNIF_FRAC_HEAT_ELEC / CFNAM_FRAC_HEAT_ELEC / CFTYP_FRAC_HEAT_ELEC: Fraction of households with electricity as heating combustible
- XUNIF_FRAC_HEAT_GAS / CFNAM_FRAC_HEAT_GAS / CFTYP_FRAC_HEAT_GAS: Fraction of households with gas as heating combustible
- XUNIF_FRAC_HEAT_FUEL / CFNAM_FRAC_HEAT_FUEL / CFTYP_FRAC_HEAT_FUEL: Fraction of households with fuel as heating combustible
- XUNIF_FRAC_HEAT_OTHER / CFNAM_FRAC_HEAT_OTHER / CFTYP_FRAC_HEAT_OTHER: Fraction of households with other heating combustibles (e.g. wood)

- XUNIF_HOTWAT / CFNAM_HOTWAT / CFTYP_HOTWAT: Energy consumption for domestic warm water (W/m^2)
- XUNIF_F_HW_GAS / CFNAM_F_HW_GAS / CFTYP_F_HW_GAS: Fraction of domestic warm water heated with gas

4.4.12 NAM_DATA_TEB_GREENROOF

Name	Type	Values	Default	X-Reference
NTIME_GR	integer	1,12	1	
NLAYER_GR	integer	≤ 6	6	
CTYP_GR	character(LEN=5)	'GRASS','SEDUM'	'GRASS'	
XUNIF_OM_GR	real,dimension(NLAYER_GR)	[0,1]	1.E+20	
XUNIF_CLAY_GR	real,dimension(NLAYER_GR)	[0,1]	1.E+20	
XUNIF_SAND_GR	real,dimension(NLAYER_GR)	[0,1]	1.E+20	
XUNIF_LAI_GR	real,dimension(NTIME_GR)		1.E+20	
CFNAM_OM_GR	character(LEN=28),dim(NLAYER_GR)		"	
CFNAM_CLAY_GR	character(LEN=28),dim(NLAYER_GR)		"	
CFNAM_SAND_GR	character(LEN=28),dim(NLAYER_GR)		"	
CFNAM_LAI_GR	character(LEN=28),dim(NTIME_GR)		"	
CFTYP_OM_GR	character(LEN=6),dim(NLAYER_GR)	'DIRECT','ASCLLV' 'BINLLV','BINLLF'	"	
CFTYP_CLAY_GR	character(LEN=6),dim(NLAYER_GR)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'	"	
CFTYP_SAND_GR	character(LEN=6),dim(NLAYER_GR)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'	"	
CFTYP_LAI_GR	character(LEN=6),dim(NTIME_GR)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'	"	

- NTIME_GR: time dimension (1=uniform LAI / 12=monthly LAI)
- NLAYER_GR: number of layers in greenroofs
- CTYP_GR: type of vegetation for greenroofs
  - 'GRASS': Grasses - graminoïds
  - 'SEDUM': Sedum (succulent plants)
- XUNIF_OM_GR / CFNAM_OM_GR / CFTYP_OM_GR: fraction of organic matter in greenroof layer
- XUNIF_CLAY_GR / CFNAM_CLAY_GR / CFTYP_CLAY_GR: fraction of clay for the non-OM part of the green roof layer
- XUNIF_SAND_GR / CFNAM_SAND_GR / CFTYP_SAND_GR: fraction of sand for the non-OM part of the green roof layer
- XUNIF_LAI_GR / CFNAM_LAI_GR / CFTYP_LAI_GR: LAI of green roof vegetation (m^2/m^2)

4.4.13 NAM_DATA_TEB_HYDRO

Namelist for parameters for urban soil and hydrology processes (LURBHYDRO=T)

Name	Type	Values	Default	X-Reference
XUNIF_DENS_WASTE	real	>0	1.E+20	
CFNAM_DENS_WASTE	character(LEN=28)			
CFTYP_DENS_WASTE	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_DENS_STORM	real	>0	1.E+20	
CFNAM_DENS_STORM	character(LEN=28)			
CFTYP_DENS_STORM	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_DSEWER	real		1.E+20	
CFNAM_DSEWER	character(LEN=28)			
CFTYP_DSEWER	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_WS_ROOF_MAX	real	>0	1	
CFNAM_WS_ROOF_MAX	character(LEN=28)			
CFTYP_WS_ROOF_MAX	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_WS_ROAD_MAX	real	>0	1	
CFNAM_WS_ROAD_MAX	character(LEN=28)			
CFTYP_WS_ROAD_MAX	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_IP_SEWER	real		0	
CFNAM_IP_SEWER	character(LEN=28)	[0-1]		
CFTYP_IP_SEWER	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_CONNEX	real	[0-1]	1	
CFNAM_CONNEX	character(LEN=28)			
CFTYP_CONNEX	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_INFIL_ROAD	real	>0	0	
CFNAM_INFIL_ROAD	character(LEN=28)			
CFTYP_INFIL_ROAD	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		
XUNIF_URBDRAIN	real	[0-1]	0	
CFNAM_URBDRAIN	character(LEN=28)			
CFTYP_URBDRAIN	character(LEN=6)	'DIRECT','ASCLLV', 'BINLLV','BINLLF'		

- XUNIF_DENS_WASTE / CFNAM_DENS_WASTE / CFTYP_DENS_WASTE: wastewater sewer length density (-)
- XUNIF_DENS_STORM / CFNAM_DENS_STORM / CFTYP_DENS_STORM: tormwater sewer length density (-)
- XUNIF_DSEWER / CFNAM_DSEWER / CFTYP_DSEWER: waste water sewer depth (m)
- XUNIF_WS_ROOF_MAX / CFNAM_WS_ROOF_MAX / CFTYP_WS_ROOF_MAX: maximum capacity of surface roof water storage (mm)
- XUNIF_WS_ROAD_MAX / CFNAM_WS_ROAD_MAX / CFTYP_WS_ROAD_MAX: maximum capacity of surface road water storage (mm)
- XUNIF_IP_SEWER / CFNAM_IP_SEWER / CFTYP_IP_SEWER: parasite infiltrations into sewer (-)
- XUNIF_CONNEX / CFNAM_CONNEX/ CFTYP_CONNEX: impervious surfaces connexion rate to the sewer (-)

- XUNIF_INFIL_ROAD / CFNAM_INFIL_ROAD / CFTYP_INFIL_ROAD: water infiltration through the roads (kg/m^2/s)
- XUNIF_URBDRAIN / CFNAM_URBDRAIN / CFTYP_URBDRAIN :limitation fraction of urban deep drainage (-)

4.4.14 NAM_ECOCLIMAP2

This namelist allows to choose which LAI is used: a climatological one (average over years 2002-2006) or a specific year (between 2002 and 2006). This is the place to define irrigation file.

Name	Type	Values	Default	X-Reference
LCLIM_LAI	logical		T	
YIRRIG	character(LEN=28)		' '	

- LCLIM_LAI: if T, climatological LAI is computed otherwise, the LAI corresponding to current year (if between 2002 and 2006) is used.
- YIRRIG: irrigation file name

4.4.15 NAM_DUMMY_PGD

This namelist allows to incorporate into the physiographic file any surface field.

You can treat up to 999 such fields. These fields will be written on all the files you will use later(after prognostic fields initialization, or during and after run, etc...). Their name in the files are 'DUMMY_GRnnn', where nnn goes from 001 to 999.

During the execution of the programs, these fields are stored in the XDUMMY_FIELDS(:,:) (first dimension: spatial dimension, second dimension: total number of fields), in the module MODD_DUMMY_SURF_FIELDn. You must modify the fortran source, where you want to use them.

Name	Type	Default	X-Reference
NDUMMY_NBR	integer	0	
CDUMMY_NAME(:)	1000 * character(LEN=20)	1000 * ' '	
CDUMMY_FILE(:)	1000 * character(LEN=28)	1000 * ' '	
CDUMMY_FILETYPE(:)	1000 * character(LEN=6)	1000 *' '	
CDUMMY_AREA(:)	1000 * character(LEN=3)	1000 *'ALL'	
CDUMMY_ATYPE(:)	1000 * character(LEN=3)	1000 *'ARI'	

Only the first NDUMMY_NBR values in these arrays are meaningfull.

- NDUMMY_NBR: number of dummy fields.
- CDUMMY_NAME(:): list of the dummy fields you want to initialize with your own data. You can give any name you want. This is a way to describe what is the field. This information is not used by the program. It is just written in the FM files.
- CDUMMY_FILE(:): list of the names of the files containing the data for the fields you have specified in CDUMMY_NAME(:).
- CDUMMY_FILETYPE(:): list of the types of the files containing the data for the fields you have specified in CDUMMY_NAME(:) ('DIRECT', 'LATLON', 'BINLLF', 'BINLLV', 'ASCLLV').

- CDUMMY_AREA(:):area of meaningfullness of the fields you have specified in CDUMMY_NAME(:) ('ALL', 'NAT', 'TWN', 'SEA', 'WAT', 'LAN', respectively for everywhere, natural areas, town areas, sea, inland waters, land = natural cover + town). For example, oceanic emission of DNS is relevant on 'SEA'.
- CDUMMY_ATYPE(:) :type of averaging (during PGD for the fields you have specified in CDUMMY_NAME(:) ('ARI', 'INV', 'LOG', respectively for arithmetic, inverse and logarithmic averaging).

4.5 Chemistry anthropogenic emissions

4.5.1 NAM_CH_EMISSIONS

Name	Type	Values	Default	X-Reference
CCH_EMIS	character(LEN=4)	'NONE','AGGR','SNAP'	'NONE'	

- CCH_EMIS: option for emissions computations:
  - "NONE": no emission
  - "AGGR": one aggregated value for each specie and hour
  - "SNAP": from SNAP data using potential emission and temporal profile

These two options available for the chemical emissions are exclusive. In general, emission inventories are built using the SNAP approach. The data provided can be either under this SNAP form, or under aggregated form, after an additional treatment (data is usually provided from inventory institutes to the user under this form).

4.5.2 NAM_CH_EMIS_PGD

This namelist is used to initialize chemistry components emissions.

You can treat up to 999 such fields. These fields will be written on all the files you will use later (after prognostic fields initialization, or during and after run, etc...). Their name in the files are 'EMIS_GRnnn', where nnn goes from 001 to 999.

During the execution of the programs, these fields are stored in the XEMIS_GR_FIELDS(:,:) (first dimension: spatial dimension, second dimension: total number of fields), in the module MODD_EMIS_GR_FIELDn. The temporal evolution, the aggregation of prescribed emissions and the link with the corresponding chemical prognostic variables are handled by the subroutine CH_EMISSION_FLUXn.f90

Name	Type	Default	X-Reference
NEMIS_PGD_NBR	integer	0	
CEMIS_PGD_NAME(:)	1000 * character(LEN=20)	1000 * ' '	
CEMIS_PGD_FILE(:)	1000 * character(LEN=28)	1000 * ' '	
CEMIS_PGD_COMMENT(:)	1000 * character(LEN=40)	1000 * ' '	
NEMIS_PGD_TIME	integer	0	
CEMIS_PGD_FILETYPE(:)	1000 * character(LEN=6)	1000 *'DIRECT'	
CEMIS_PGD_AREA(:)	1000 * character(LEN=3)	1000 *'ALL'	
CEMIS_PGD_ATYPE(:)	1000 * character(LEN=3)	1000 *'ARI'	

Only the first NEMIS_PGD_NBR values in these arrays are meaningfull.

- NEMIS_PGD_NBR: number of dummy fields.
- CEMIS_PGD_NAME(:): list of the dummy fields you want to initialize with your own data. You can give any name you want. This is a way to describe what is the field. This information is not used by the program. It is just written in the FM files.
- CEMIS_PGD_FILE(:): list of the names of the files containing the data for the fields you have specified in CEMIS_PGD_NAME(:).
- CEMIS_PGD_COMMENT(:): list of the comments associated to each emission field.
- NEMIS_PGD_TIME(:): list of the time of the files containing the data for the fields you have specified in CEMIS_PGD_NAME(:).

- CEMIS_PGD_FILETYPE(:): list of the types of the files containing the data for the fields you have specified in CEMIS_PGD_NAME(:) ('DIRECT', 'BINLLF', 'BINLLV', 'ASCLLV').
- CEMIS_PGD_AREA(:)>: area of meaningfullness of the fields you have specified in CEMIS_PGD_NAME(:) ('ALL', 'NAT', 'TWN', 'SEA', 'WAT', 'LAN', respectively for everywhere, natural areas, town areas, sea, inland waters, land = natural cover + town). For example, oceanic emission of DNS is relevant on 'SEA'.
- CEMIS_PGD_ATYPE(:): type of averaging (during PGD for the fields you have specified in CEMIS_PGD_NAME(:) ('ARI', 'INV', 'LOG', respectively for arithmetic, inverse and logarithmic averaging). Example:

```
&NAM_CH_EMIS_PGD
    NEMIS_PGD_NBR  = 2,
    CEMIS_PGD_NAME(1)='COE',
    NEMIS_PGD_TIME(1)=0,
    CEMIS_PGD_COMMENT(1)='CO_00h00',
    CEMIS_PGD_AREA(1)='LAN',
    CEMIS_PGD_ATYPE(1)='ARI',
    CEMIS_PGD_FILE(1)='co_00.asc',
    CEMIS_PGD_FILETYPE(1)='ASCLLV',
    CEMIS_PGD_NAME(2)='COE',
    NEMIS_PGD_TIME(2)=43200,
    CEMIS_PGD_COMMENT(2)='CO_12h00',
    CEMIS_PGD_AREA(2)='LAN',
    CEMIS_PGD_ATYPE(2)='ARI',
    CEMIS_PGD_FILE(2)='co_12.asc',
    CEMIS_PGD_FILETYPE(2)='ASCLLV',
    CEMIS_PGD_NAME(3)='DMSE',
    NEMIS_PGD_TIME(3)=0,
    CEMIS_PGD_COMMENT(3)='dms_cte',
    CEMIS_PGD_AREA(3)='SEA',
    CEMIS_PGD_ATYPE(3)='ARI',
    CEMIS_PGD_FILE(3)='dms.asc',
    CEMIS_PGD_FILETYPE(3)='ASCLLV'
/
```

4.5.3 NAM_CH_SNAP_EMIS_PGD

Name	Type	Values	Default	X-Reference
NEMIS_NBR	integer		0	
NEMIS_SNAP	integer		0	
CEMIS_NAME	character(LEN=6)		"	
CEMIS_COMMENT	character(LEN=40)		"	
CSNAP_MONTHLY_FILE	character(LEN=28)		"	
CSNAP_DAILY_FILE	character(LEN=28)		"	
CSNAP_HOURLY_FILE	character(LEN=28)		"	
CSNAP _POTENTIAL_FILE	character(LEN=50)		"	
CSNAP_POTENTIAL_FILETYPE	character(LEN=6)	'DIRECT', 'BINLLV' 'BINLLF', 'ASCLLV' 'LATLON'	"	
XUNIF_SNAP	real		none	
XUNIF_DELTA_LEGAL_TIME	real		none	
CDELTA_LEGAL_TIME_FILE	character(LEN=50)		"	
CDELTA_LEGAL_TIME_FILETYPE	character(LEN=6)	'DIRECT', 'BINLLV' 'BINLLF', 'ASCLLV' 'LATLON'	"	

- NEMIS_NBR: number of chemical pgd fields chosen by user
- NEMIS_SNAP: number of snaps
- CEMIS_NAME: name of the chemical fields (emitted species)
- CEMIS_COMMENT: comment on the chemical fields (emitted species)
- CSNAP_MONTHLY_FILE: name of the snap ASCII monthly file
- CSNAP_DAILY_FILE: name of the snap ASCII daily file
- CSNAP_HOURLY_FILE: name of the snap ASCII hourly file
- CSNAP_POTENTIAL_FILE: name of the snap potential file
- CSNAP_POTENTIAL_FILETYPE: type of the snap potential file
- XUNIF_SNAP: uniform value for the snap potential (emission factore for each chemical specie and each snap)
- XUNIF_DELTA_LEGAL_TIME: uniform value for the difference (in hours) between lagal time and UTC time
- CDELTA_LEGAL_TIME_FILE: name of file for the difference between legal time and UTC time
- CDELTA_LEGAL_TIME_FILETYPE: filetype for the difference between legal time and UTC time

In order to compute the emissions using the SNAP (Selected Nomenclature for Air Pollution) approach, the user needs to provide :

- for each SNAP category AND for each chemical component emitted (in the emission inventory, not emitted to the atmosphere), the map of the emission potential.

- 3 files describing the temporal evolution of each emitted chemical component for each snap. Note that all chemical species emitted by one snap will follow the same temporal evolution. But for the same chemical emission between two different snaps (e.g. industry, traffic), the temporal evolution can be different. The 3 files describe :

- the annual cycle (with a monthly timescale)
- the weekly cycle (with a daily time scale), typically to separate weekdays, saturdays and sundays.
- The diurnal cycle (with an hourly time scale). Note here that the hypothesis is done that the diurnal evolution is the same whatever the day in the week. The reference for the calculation of the hour (UTC, solar, legal) is provided at the beginning of this file. This allows to have different timing in different places at the same UTC (if solar or legal time is chosen), for example between China and Europe.

Here are examples of these files (please note that these must be provided for each chemical component separately) :

Annual cycle (one SNAP per line, one Month per column, from January to December)

```
Monthly evolution of the coefficients for the 10 snaps
1.2 1.15 1.05 1 0.9 0.85 0.8 0.875 0.95 1 1.075 1.15
1.7 1.5 1.3 1 0.7 0.4 0.2 0.4 0.7 1.05 1.4 1.65
1.1 1.075 1.05 1 0.95 0.9 0.93 0.95 0.97 1 1.025 1.05
1.02 1.02 1.02 1.02 1.02 1.02 1 0.84 1.02 1.02 1.02 0.9
1.2 1.2 1.2 0.8 0.8 0.8 0.8 0.8 0.8 1.2 1.2 1.2
0.95 0.96 1.02 1 1.01 1.03 1.03 1.01 1.04 1.03 1.01 0.91
0.88 0.92 0.98 1.03 1.05 1.06 1.01 1.02 1.06 1.05 1.01 0.93
0.88 0.92 0.98 1.03 1.05 1.06 1.01 1.02 1.06 1.05 1.01 0.93
1 1 1 1 1 1 1 1 1 1 1 1
0.45 1.3 2.35 1.7 0.85 0.85 0.85 1 1.1 0.65 0.45 0.45

Weekly cycle (one SNAP per line, one day per column, from Monday to Sunday)

1.06 1.06 1.06 1.06 1.06 0.85 0.85
1.08 1.08 1.08 1.08 1.08 0.8 0.8
1.08 1.08 1.08 1.08 1.08 0.8 0.8
1.02 1.02 1.02 1.02 1.02 1.02 1
1 1 1 1 1 1 1
1.2 1.2 1.2 1.2 1.2 0.5 0.5
1.02 1.06 1.08 1.1 1.14 0.81 0.79
1 1 1 1 1 1 1
1 1 1 1 1 1 1
1 1 1 1 1 1 1

Diurnal cycle ( one SNAP per line, one Hour per column, from 00h to 23h, definition for time calculation in first line)

'SOLAR'
Hourly Evolution for the 10 snaps
0.72 0.71 0.74 0.8 0.92 1.08 1.19 1.22 1.21 1.21 1.17 1.15 1.14 1.13 1.1 1.07 1.04 1.02 1.02 1.01 0.96 0.88 0.79 0.72
0.36 0.36 0.37 0.5 1.19 1.53 1.57 1.56 1.35 1.16 1.07 1.06 1 0.98 0.99 1.12 1.41 1.52 1.39 1.35 1 0.42 0.38 0.36
0.78 0.82 0.88 0.95 1.02 1.09 1.16 1.22 1.28 1.3 1.22 1.24 1.25 1.16 1.08 1.01 0.95 0.9 0.85 0.81 0.78 0.75 0.75 0.75
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.2 0.1 0.1 0.2 0.75 1.25 1.4 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.4 1.25 1.1 1 0.9 0.8 0.7 0.5 0.35
0.06 0.05 0.09 0.22 0.86 1.84 1.86 1.41 1.24 1.2 1.32 1.44 1.45 1.59 2.03 2.08 1.51 1.06 0.74 0.62 0.61 0.44 0.19 0.09
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0.6 0.6 0.6 0.65 0.75 0.9 1.1 1.35 1.45 1.6 1.8 1.75 1.7 1.55 1.35 1.1 0.9 0.75 0.65 0.6 0.6 0.6 0.6 0.6
```

5 Initialization of the prognostic fields

The prognostic fields (temperature, humidity, ice, snow, etc...) are averaged or interpolated on the specified grid by the program PREP. They are stored in the surface file. The computation is done separately for each surface scheme.

During the PREP facility :

1. You initialize the date of the surface
2. You initialize the prognostic variables of the chosen sea scheme
3. You initialize the prognostic variables of the chosen lake scheme
4. You initialize the prognostic variables of the chosen vegetation scheme
5. You initialize the prognostic variables of the chosen town scheme

Here are presented the initialization procedures for the schemes that need such information (for example, scheme "IDEAL " does not need any information here, but modificaton of the code source init_ideal_flux.f90).

Note that for each scheme, and for some for each variable of the scheme, it is possible to initialize the prognostic fields either form an operationnal or research model, or using prescribed (usually uniform) fields.

5.1 Grid cell initialization

5.1.1 NAM_PREP_SURF_ATM

This namelist information is used to (possibly):

- initialize the date of all surface schemes. The namelist information is used only if no input data file is used, either from namelist or by fortran code (as in MESONH programs). If a file is used, the date is read in it.
- define the default file in which each scheme can read the needed data (e.g. temperature).

Note that, all the information given in this namelist can be erased for each scheme by the namelist corresponding to this scheme, as the information in the shceme namelists have priority on namelist NAM_PREP_SURF_ATM.

Name	Type	Values	Default	X-Reference
CFILE	character(LEN=28)		atmospheric prep file used in the program calling the surface facilities, if any none otherwise	
CFILETYPE	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII', 'LFI '	type of the atmospheric prep file, if any	
CFILEPGD	character(LEN=28)		atmospheric pgd file used in the program calling the surface facilities, if any none otherwise	
CFILEPGDTYPE	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII', 'LFI '	type of the atmospheric pgd file, if any	
NYEAR	integer		none	
NMONTH	integer		none	
NDAY	integer		none	
XTIME	real		none	
NHALO_PREP	integer		2	
LWRITE_EXTERN	logical		F	

- CFILE / CFILEPGD: name of the prep / pgd file used to define
  1. the date.
  2. the file in which to read the needed data (e.g. temperature).
     The use of a file or prescribed value in each scheme namelist has priority on the data in CFILE / CFILEPGD file of namelist NAM_PREP_SURF_ATM.
     CFILE and CFILEPGD can identify the same file.
- CFILETYPE / CFILEPGDTYPE: type of the CFILE / CFILEPGD file, if the latter is provided. CFILETYPE / CFILEPGDTYPE must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": AROME french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII ": ASCII Surfex PREP/PGD file
  - "LFI ": LFI Surfex PREP/PGD file
- NYEAR: year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH: month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY: day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME: time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- NHALO_PREP: halo size for the extrapolation of pronostic fields from input file
- LWRITE_EXTERN: The new key LWRITE_EXTERN is added. If LWRITE_EXTERN=T, soil depths for ISBA and TEB are written in the current output PREP file.

5.2 Sea tile initialization

This namelist information is used to initialize the "SEAFLX" sea scheme temperature.

5.2.1 NAM_PREP_SEAFLUX

Name	Type	Values	Default	X-Reference
XSST_UNIF	real		none	
CFILE_SEAFLX	character(LEN=28)		CFILE in NAM_PREP_SURF_ATM	
CTYPE_SEAFLX	character(LEN=6)	'MESONH' 'GRIB ' , 'NETCDF ' 'ASCII ','LFI '	CFILETYPE in NAM_PREP_SURF_ATM	
CFILEPGD_SEAFLX	character(LEN=28)		CFILEPGD in NAM_PREP_SURF_ATM	
CTYPEPGD	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILEPGDTYPE in NAM_PREP_SURF_ATM	
CFILEWAVE_SEAFLX	character(LEN=28)			
CTYPEWAVE	character(LEN=6)	'NETCDF '		
NYEAR	integer		none	
NMONTH	integer		none	
NDAY	integer		none	
XTIME	real		none	
LSEA_SBL	logical		F	
LOCEAN_MERCATOR	logical		F	
LOCEAN_CURRENT	logical		F	
XTIME_REL	real		25920000.	
LCUR_REL	logical		F	
LTS_REL	logical		F	
LZERO_FLUX	logical		F	
LCORR_FLUX	logical		F	
XCORFLX	real		0.	
LDIAPYC	logical		F	
CSEAICE_SCHEME	character(LEN=6)	'GELATO', 'NONE'	'NONE "	
XSSS_UNIF	real		1.E+20	
XSIC_UNIF	real		1.E+20	

- XSST_UNIF: uniform prescribed value of Sea Surface Temperature. This prescribed value, if defined, has priority on the use of CFILE_SEAFLX data.
- CFILE_SEAFLX / CFILEPGD_SEAFLX: name of the PREP/PGD files used to define the Sea surface Temperature. The use of a file or prescribed value XSST_UNIF has priority on the data in CFILE_SEAFLX file.
- CTYPE_SEAFLX / CTYPEPGD: type of the CFILE_SEAFLX / CFILEPGD_SEAFLX files, if the latter is provided.
  CTYPE_SEAFLX must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": AROME french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "NETCDF": the file type is a NETCDF file, coming from MERCATOR (possible only for CTYPE_SEAFLX)
  - "ASCII ": PREP/PGD Surfex ASCII file
  - "LFI ": PREP/PGD Surfex LFI file
- CFILEWAVE_SEAFLX: name of the file used to define the significant wave height (Hs) and the peak period (Tp)

- CTYPEWAVE: type of the CFILEWAVE_SEAFLX file if the latter is provided. CTYPEWAVE must be given. The 'NETCDF' value (if the file type is a netcdf file) is the only one usable. Other 'PREP_SEAFLUX' types are under development and lead now to uniform values of wave parameters.
- NYEAR: year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH: month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY: day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME: time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LSEA_SBL: activates surface boundary multi layer scheme over sea.
- LOCEAN_MERCATOR: oceanic variables initialized from MERCATOR if T
- LOCEAN_CURRENT: initial ocean state with current (if F ucur=0, vcur=0)
- XTIME_REL: time of relaxation (s)
- LCUR_REL: flag for relaxation on current
- LTS_REL: flag for relaxation on ocean temperature
- LZERO_FLUX: flag for testing zero incoming flux at the ocean surface
- LCORR_FLUX: flag for flux correction
- XCORFLX: correction coefficient for surface fluxes
- LDIAPYC: flag for diapycnal mixing activation
- XSSS_UNIF: from V8, uniform prescribed value of Sea Surface Salinity. This prescribed value, if defined, has priority on the use of CFILE_SEAFLX data.
- CSEAICE_SCHEME: from V8, name of the sea-ice scheme to activate. For details, see 6.2.4. Gelato sea-ice scheme
- XSIC_UNIF: uniform sea ice covert fraction

5.3 Inland water tile initialization

This namelist information is used to initialize the "WATFLX" sea scheme temperature.

5.3.1 NAM_PREP_WATFLUX

Name	Type	Values	Default	X-Reference
XTS_WATER_UNIF	real		none	
CFILE_WATFLX	character(LEN=28)		CFILE in NAM_PREP_SURF_ATM	
CTYPE	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILETYPE in NAM_PREP_SURF_ATM	
CFILEPGD_WATFLX	character(LEN=28)		CFILEPGD in NAM_PREP_SURF_ATM	
CTYPEPGD	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILEPGDTYPE in NAM_PREP_SURF_ATM	
NYEAR	integer		none	
NMONTH	integer		none	
NDAY	integer		none	
XTIME	real		none	
LWAT_SBL	logical		F	

- XTS_WATER_UNIF: uniform prescribed value of water surface temperature supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_WATFLX data.
- CFILE_WATFLX / CFILEPGD_WATFLX: name of the PREP / PGD files used to define the Sea surface Temperature. The use of a file or prescribed value XTS_WATER_UNIF has priority on the data in CFILE_WATFLX file.
- CTYPE / CTYPEPGD: type of the CFILE_WATFLX / CFILEPGD_WATFLX file, if the latter is provided. CTYPE / CTYPEPGD must then be given. The following values are currently usable:
- "MESONH": the file type is a MESONH file.
- "GRIB ": the file type is a GRIB file, coming from any of these models:
  1. "ECMWF ": european center forecast model
  2. "ARPEGE": Arpege french forecast model
  3. "AROME": AROME french forecast local model
  4. "MOCAGE": Mocage french research chemistry model
- "ASCII ": PREP / PGD Surfex ASCII file
- "LFI ": PREP/PGD Surfex LFI file
- NYEAR: year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH: month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY: day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME: time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LWAT_SBL: activates surface boundary multi layer scheme over inland water.

5.3.2 NAM_PREP_FLAKE

This namelist information is used to initialize the "FLAKE" sea scheme temperature.

Name	Type	Values	Default	X-Reference
XTS_UNIF	real		none	
XUNIF_T_SNOW	real		min(273.15,XTS_WATER)	
XUNIF_T_ICE	real		min(273.15,XTS_WATER)	
XUNIF_T_WML	real		min(273.15,XTS_WATER)	
XUNIF_T_BOT	real		TS_WATER or 277.15 if TS_WATER $\leq$ 273.15	
XUNIF_T_B1	real		TS_WATER-0.1 or 277.05 if TS_WATER $\leq$ 273.15	
XUNIF_CT	real		0.5	
XUNIF_H_SNOW	real		0.	
XUNIF_H_ICE	real		0. or 0.01 if XTS_WATER XTS_WATER $\leq$ 273.15	
XUNIF_H_ML XUNIF_H_ML XUNIF_H_ML	real real real		XWATER_DEPTH or XWATER_DEPTH/2 if TS_WATER $\leq$ 273.15	
XUNIF_H_B1	real		0.	
CFILE_FLAKE	character(LEN=28)		CFILE in NAM_PREP_SURF_ATM	
CTYPE	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ,'LFI '	CFILETYPE in NAM_PREP_SURF_ATM	
CFILEPGD_FLAKE	character(LEN=28)		CFILEPGD in NAM_PREP_SURF_ATM	
CTYPEPGD	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILEPGDTYPE in NAM_PREP_SURF_ATM	
LCLIM_LAKE	logical		F	
NYEAR	integer		none	
NMONTH	integer		none	
NDAY	integer		none	
XTIME	real		none	
LWAT_SBL	logical		F	

- XTS_UNIF: uniform prescribed value of water surface temperature supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_FLAKE data.
- XUNIF_T_SNOW: surface temperature of snow (K)
- XUNIF_T_ICE: surface temperature at the ice-atmosphere or at the ice-snow interface (K)
- XUNIF_T_WML: mixed-layer temperature (K)
- XUNIF_T_BOT: water temperature at the bottom of the lake (K)
- XUNIF_T_B1: temperature at the bottom of the upper layer of sediments (K)
- XUNIF_CT: shape factor (thermocline)
- XUNIF_H_SNOW: snow layer thickness (m)
- XUNIF_H_ICE: ice layer thickness (m)
- XUNIF_H_ML: thickness of the mixed-layer (m)
- XUNIF_H_B1: thickness of the upper level of the active sediments (m)

- CFILE_FLAKE / CFILEPGD_FLAKE: name of the PREP and PGD files used to define the Sea surface Temperature. The use of a file or prescribed value XTS_WATER_UNIF has priority on the data in CFILE_FLAKE file.
- CTYPE / CTYPEPGD: type of the CFILE_FLAKE / CFILEPGD_FLAKE files, if the latter is provided. CTYPE / CTYPEPGD must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": AROME french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII": Surfex PREP / PGD ASCII file
  - "LFI ": Surfex PREP / PGD LFI file
- LCLIM_LAKE: to use the climatological lake database to initialise FLAKE pronostic variables. Needs to link with LAKE_LTA_NEW.nc.
- NYEAR: year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH: month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY: day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME: time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LWAT_SBL: activates surface boundary multi layer scheme over inland water.

5.4 Nature tile initialization

5.4.1 NAM_PREP_ISBA

Name	Type	Values	Default	X-Reference
CFILE_ISBA	character(LEN=28)		CFILE in NAM_PREP_SURF_ATM	
CTYPE	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILETYPE in NAM_PREP_SURF_ATM	
CFILEPGD_ISBA	character(LEN=28)		CFILEPGD in NAM_PREP_SURF_ATM	
CTYPEPGD	character(LEN=6)	'MESONH' 'ASCII ','LFI '	CFILEPGDTYPE in NAM_PREP_SURF_ATM	
XHUG_SURF	real		none	
XHUG_ROOT	real		none	
XHUG_DEEP	real		none	
XHUGI_SURF	real		none	
XHUGI_ROOT	real		none	
XHUGI_DEEP	real		none	
CFILE_HUG_SURF	character(LEN=28)		CFILE_HUG in this namelist	
CFILE_HUG_ROOT	character(LEN=28)		CFILE_HUG in this namelist	
CFILE_HUG_DEEP	character(LEN=28)		CFILE_HUG in this namelist	
CFILE_HUG	characters		CFILE_ISBA in this namelist	
CTYPE_HUG	character(LEN=6)	'MESONH', 'GRIB ' 'LFI ','ASCII ' 'ASCLLV','NETCDF'	CTYPE in this namelist CTYPE in this namelist CTYPE in this namelist	
XTG_SURF	real		none	
XTG_ROOT	real		none	
XTG_DEEP	real		none	
CFILE_TG_SURF	character(LEN=28)		CFILE_TG in this namelist	
CFILE_TG_ROOT	character(LEN=28)		CFILE_TG in this namelist	
CFILE_TG_DEEP	character(LEN=28)		CFILE_TG in this namelist	
CFILE_TG	character(LEN=28)		CFILE_ISBA in this namelist	
CTYPE_TG	character(LEN=6)	'MESONH', 'GRIB ' 'LFI ', 'ASCII ' 'ASCLLV','NETCDF'	CTYPE in this namelist CTYPE in this namelist CTYPE in this namelist	
NYEAR	integer		none	
NMONTH	integer		none	
NDAY	integer		none	
XTIME	real		none	
LISBA_CANOPY	logical		F	
LEXTRAP_TG	logical		F	
LEXTRAP_WG	logical		F	
LEXTRAP_WGI	logical		F	
LEXTRAP_SN	logical		F	

- CFILE_ISBA / CFILEPGD_ISBA: name of the PREP / PGD files used to define any ISBA variable. The use of a file or prescribed value XHUG_SURF, XHUG_ROOT, XHUG_DEEP, XTG_SURF, XTG_ROOT, XTG_DEEP, CFILE_WG and CFILE_TG has priority on the data in CFILE_ISBA file.
- CTYPE / CTYPEPGD: type of the CFILE_ISBA / CFILEPGD_ISBA files, if the latter is

provided. CTYPE / CTYPEPGD must then be given. The following values are currently usable:

  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": AROME french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII ": PREP/PGD Surfex ASCII file
  - "LFI ": PREP/PGD Surfex LFI file

- XHUG_SURF: uniform prescribed value of liquid soil water index (SWI) for the surface soil layer. This prescribed value, if defined, has priority on the use of CFILE_HUG and CFILE_ISBA data.
- XHUG_ROOT: uniform prescribed value of liquid soil water index (SWI) for the root zone soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG and CFILE_ISBA data.
- XHUG_DEEP: uniform prescribed value of liquid soil water index (SWI) for the deep soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG and CFILE_ISBA data.
- XHUGI_SURF: uniform prescribed value of ice soil water index (SWI) for the surface soil layer. This prescribed value, if defined, has priority on the use of CFILE_HUG and CFILE_ISBA data.
- XHUGI_ROOT :uniform prescribed value of ice soil water index (SWI) for the root zone soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG and CFILE_ISBA data.
- XHUGI_DEEP: uniform prescribed value of ice soil water index (SWI) for the deep soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG and CFILE_ISBA data.
- CFILE_HUG_SURF: name of the file used to define the liquid soil water index (SWI) for the surface soil layer.
- CFILE_HUG_ROOT: name of the file used to define the liquid soil water index (SWI) for the root zone soil layer(s).
- CFILE_HUG_DEEP: name of the file used to define the liquid soil water index (SWI) for the deep soil layer(s).
- CFILE_HUG: name of the file used to define the soil water profiles.
- The use of a file or prescribed value of XHUG_SURF, XHUG_ROOT and XHUG_DEEP has priority on the data in CFILE_HUG file.
- CTYPE_HUG: type of the CFILE_HUG file, if the latter is provided. CTYPE_HUG must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": AROME french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII / LFI ": PREP file from Surfex
  - "ASCLLV": ASCII latlonval file (one file for each depth)

  - "NETCDF": netcdf standard file (one variable by depth)

- XTG_SURF: uniform prescribed value of temperature for the surface soil layer, supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG and CFILE_ISBA data.
- XTG_ROOT: uniform prescribed value of temperature for the root zone soil layer(s), supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG and CFILE_ISBA data.
- XTG_DEEP: uniform prescribed value of temperature for the deep soil layer(s), supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG and CFILE_ISBA data.
- CFILE_TG_SURF: name of the file used to define the surface soil temperature profile.
- CFILE_TG_ROOT: name of the file used to define the root zone soil temperature profile.
- CFILE_TG_DEEP: name of the file used to define the deep soil temperature profile.
- CFILE_TG: name of the file used to define the soil temperature profile.
  The use of a file or prescribed value of XTG_SURF, XTG_ROOT and XTG_DEEP has priority on the data in CFILE_TG file.
- CTYPE_TG: type of the CFILE_TG file, if the latter is provided. CTYPE_TG must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": AROME french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII / LFI ": PREP file from Surfex
  - "ASCLLV": ASCII latlonval file (one file for each depth)
  - "NETCDF": netcdf standard file (one variable by depth)
- NYEAR: year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH: month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY: day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME: time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LISBA_CANOPY: activates surface boundary multi layer scheme over vegetation.
- LEXTRAP_TG: extrapolate TG points where LSM < 0.5 (buffer only)
- LEXTRAP_WG: extrapolate WG points where LSM < 0.5 (buffer only)
- LEXTRAP_WGI: extrapolate WGI points where LSM < 0.5 (buffer only)
- LEXTRAP_: extrapolate SNOW (SWE/depth) points where LSM < 0.5 (buffer only)

5.4.2 NAM_PREP_ISBA_SNOW

This namelist defines the type of snow scheme used in ISBA scheme.

Name	Type	Values	Default	X-Reference
CSNOW	character(LEN=3)	'D95', '3-L' 'EBA','CRO'	'D95'	
NSNOW_LAYER	integer		1	
CFILE_SNOW	character(LEN=28)		CFILE_ISBA in NAM_PREP_ISBA	
CTYPE_SNOW	character(LEN=6)	'MESONH', 'GRIB ' 'LFI ' ,'ASCII '	CTYPE in NAM_PREP_ISBA	
CFILEPGD_SNOW	character(LEN=28)		CFILEPGD_ISBA in NAM_PREP_ISBA	
CTYPEPGD_SNOW	character(LEN=6)	'MESONH', 'LFI ' 'ASCII'	CTYPEPGD in NAM_PREP_ISBA	
LSNOW_IDEAL	logical		F	
LSNOW_FRAC_TOT	logical		F	
LSNOW_PREP_PERM	logical		T	
XWSNOW	real(20)		0.	
XZSNOW	real(20)		1.E+20	
XTSNOW	real(20)		273.16	
XLWCSNOW	real(20)		0.	
XRSNOW	real(20)		300.	
XASNOW	real		0.5	
XSG1SNOW	real(20)		none	
XSG2SNOW	real(20)		none	
XHISTSNOW	real(20)		none	
XAGESNOW	real(20)		none	
LSWEMAX	logical		F	
XSWEMAX	real		500.	
NIMPUR	integer	0,1,2	0	

- CSNOW: type of snow scheme. Possible snow schemes are:
  1. 'D95': Douville et al (1995) snow scheme.
  2. '3-L': Boone and Etchevers (2001); Decharme et al. (2016) N-layer (default 12) snow scheme
  3. 'EBA': Bogatchev and Bazile (2005), Arpege operational snow scheme.
  4. 'CRO': Crocus model
- NSNOW_LAYER: number of snow layers
- CFILE_SNOW: name of the file used to define the snow profiles. The use of a file or prescribed value of XRSNOW, XTSNOW, XWSNOW and XASNOW (and XSG1SNOW, XSG2SNOW, XHISTSNOW and XAGESNOW in case of CSNOW = CROCUS) has priority on the data in CFILE_SNOW file
- CTYPE_SNOW: type of the CFILE_SNOW file, if the latter is provided. CTYPE_SNOW must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": AROME french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "LFI ": LFI PREP file
  - "ASCII": ASCII PREP FILE

- CFILEPGD_SNOW: name of the associated PGD file if CFILE_SNOW is a PREP files.
- CTYPEPGD_SNOW: type of the CFILEPGD_SNOW file, if the latter is provided. CTYPEPGD_SNOW must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "LFI ": LFI PREP file
  - "ASCII": ASCII PREP FILE
- LSNOW_IDEAL: if LSNOW_IDEAL = F , only one value can be given for following snow parameters and a vertical interpolation is processed. If LSNOW_IDEAL = T, values are given for each layer and there is no vertical interpolation performed.
- LSNOW_FRAC_TOT: if LSNOW_FRAC_TOT = T, the total snow fraction XPSN = MIN(1.0, ZSNOWSWE(:)/XWCRN_EXPL) where ZSNOWSWE is the snow liquid water content, and XWCRN_EXPL is the critical value of the equivalent water content of the snow reservoir.
- LSNOW_PREP_PERM: activates or disactivates initialization over permanent ice areas.
- XWSNOW: uniform value to initialize snow content, one for each layer
- XZSNOW: depth of snow layers (m). Alternative to XWSNOW.
- XTSNOW: uniform value to initialize snow temperature, one for each layer
- XLWCSNOW: snow liquid water content (kg/m3)
- XRSNOW: uniform value to initialize snow density, one for each layer
- XASNOW: uniform value to initialize snow albedo
- XSG1SNOW: uniform value to initialize snow layers grain feature 1 for Crocus, one for each layer
- XSG2SNOW: uniform value to initialize snow layers grain feature 2 for Crocus, one for each layer
- XHISTSNOW: uniform value to initialize snow layer grain historical parameter for Crocus, one for each layer
- XAGESNOW: uniform value to initialize snow grain age for Crocus, one for each layer
- LSWEMAX: logical switch to set an upper limit on initial snow water equivalent
- XSWEMAX: upper limit of initial snow water equivalent
- NIMPUR: number of impurity you want to use in your simulation. NIMPUR=1 with black carbon only and NIMPUR=2 with black carbon and dust (to run a simulation with dust only you can set NIMPUR=2 and prescribe no black carbon deposition)

5.4.3 NAM_PREP_ISBA_CARBON

Name	Type	Values	Default	X-Reference
CRESPSL	character(LEN=3)	'DEF', 'N92', 'PRM', 'CNT', 'DIF'	'DEF'	
LSOILGAS	logical		F	
LRESET_CSOIL	logical		F	

- CRESPSL: soil respiration option. Possible values are:
  - 'DEF': no soil respiration
  - 'N92': Ecosystem respiration from Norman et al. 1992 (odl 'DEF' option befoire V9)
  - 'PRM': Rivalland 2003

  - 'CNT': Heterotrophic respiration following CENTURY model from Gibelin et al. 2008
  - 'DIF': activation of the carbon soil dynamics (discretization of soil carbon) from Morel et al. 2019 (JAMES)

- LSOILGAS: activation of the soil gas diffusion module to simulate O2, CO2 and CH4 soil dynamics from Morel et al. 2019 (JAMES). !!! this scheme is actually a prototype !!!

- LRESET_CSOIL: Flag to initialize isba physic but not soil carbon

5.5 Urban tile initialization

5.5.1 NAM_PREP_TEB

This namelist information is used to initialize the "TEB " urban scheme variables: road, roof and wall temperature profiles, water intercepted by roofs and roads, snow, building internal temperature.

Name	Type	Values	Default	X-Reference
XWS_ROAD	real		none	
XWS_ROOF	real		none	
CFILE_WS	character(LEN=28)		CFILE_TEB in this namelist	
CTYPE_WS	character(LEN=6)	'MESONH', 'GRIB ' 'LFI '	CTYPE in this namelist	
XTS_ROAD	real		none	
XTS_ROOF	real		none	
XTS_WALL	real		none	
XTI_BLD	real		none	
XHUI_BLD	real		none	
CROAD_DIR	character(LEN=4)	'UNIF','ORIE'	'UNIF'	
CWALL_OPT	character(LEN=4)	'UNIF','TWO '	'UNIF'	
CFILE_TS	character(LEN=28)		CFILE_TEB in this namelist	
CTYPE_TS	character(LEN=6)	'MESONH', 'GRIB ' 'LFI '	CTYPE in this namelist	
CFILE_TEB	character(LEN=28)		CFILE in NAM_PREP_SURF_ATM	
CTYPE	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILETYPE in NAM_PREP_SURF_ATM	
CFILEPGD_TEB	character(LEN=28)		CFILEPGD in NAM_PREP_SURF_ATM	
CTYPEPGD	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILEPGDTYPE in NAM_PREP_SURF_ATM	
NYEAR	integer		none	
NMONTH	integer		none	
NDAY	integer		none	
XTIME	real		none	
LTEB_CANOPY	logical		F	
LATM_CANOPY	logical		F	
XTDEEP_TEB	real		1.E+20	
XTS_BLD	real		17+XTT (XTT for triple point temperature = 273.16)	

- XWS_ROAD: uniform prescribed value of soil water interception for the road reservoir. This prescribed value, if defined, has priority on the use of CFILE_WS and CFILE_TEB data.

- XWS_ROOF: uniform prescribed value of soil water interception for the roof reservoir. This prescribed value, if defined, has priority on the use of CFILE_WS and CFILE_TEB data.

- CFILE_WS: name of the file used to define the soil water reservoirs. The use of a file or prescribed value of XWS_ROAD and XWS_ROOF has priority on the data in CFILE_WS file.

- CTYPE_WS: type of the CFILE_WS file, if the latter is provided. CTYPE_WS must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
- XTS_ROAD: uniform prescribed value of temperature for road, supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
- XTS_ROOF: uniform prescribed value of temperature for roof, supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
- XTS_WALL: uniform prescribed value of temperature for wall, supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
- XTI_BLD: uniform prescribed value of internal building temperature. This temperature is not dependent on altitude. This prescribed value, if defined, has priority on the use of CFILE_TS and CFILE_TEB data.
- XHUI_BLD: uniform bulding relative hum (between 0-1)
- CROAD_DIR: TEB option for road direction:
  - UNIF: no specific direction
  - ORIE: many road ORIEntations (linked to NTEB_PATCH)
- CWALL_OPT: TEB option for walls:
  - UNIF: uniform walls
  - TWO: two separated walls
- CFILE_TS: name of the file used to define the soil temperature profile. The use of a file or prescribed value of XTS_ROAD, XTS_ROOF, XTS_WALL, XTI_BLD or XTI_ROAD has priority on the data in CFILE_TS file.
- CTYPE_TS: type of the CFILE_TS file, if the latter is provided. CTYPE_TS must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model

- CFILE_TEB / CFILEPGD_TEB: name of the PREP/PGD files used to define any TEB variable. The use of a file or prescribed value XWS_ROAD, XWS_ROOF, XTS_ROAD, XTS_ROOF, XTS_WALL, XTI_BLD, XTI_ROAD, CFILE_WS or CFILE_TS has priority on the data in CFILE_TEB file.
- CTYPE / CTYPEPGD: type of the CFILE_TEB / CFILEPGD_TEB file, if the latter is provided. CTYPE must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII ": PREP/PGD Surfex ASCII file
  - "LFI ": PREP/PGD Surfex LFI file
- NYEAR: year of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NMONTH: month of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- NDAY: day of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read).
- XTIME: time from midnight of surface UTC time. It is used only if no atmospheric file or no surface file is given (in those the date can be read). (seconds).
- LTEB_CANOPY: activates surface boundary multi layer scheme over town.
- LATM_CANOPY: flag to replace canopy prognostic variables by atmospheric models prognostic variables
- XTDEEP_TEB: deep temperature for TEB soil (K). XTS_BLD corresponds to the old key XTI_ROAD (before V9)
- XTS_BLD: soil below buildings uniform temperature (K). Default value is 17+XTT (XTT for triple point temperature = 273.16K).

5.5.2 NAM_PREP_TEB_SNOW

Name	Type	Values	Default	X-Reference
CSNOW_ROOF	character(LEN=6)	'1-L'	'1-L'	
CSNOW_ROAD	character(LEN=6)	'1-L'	'1-L'	
CFILE_SNOW_TEB	character(LEN=28)		"	
CTYPE_SNOW	character(LEN=6)	'MESONH','GRIB' 'LFI','ASCII'	"	
CFILEPGD_SNOW_TEB	character(LEN=28)		"	
CTYPEPGD_SNOW	character(LEN=6)	'MESONH','LFI','ASCII'	"	
XWSNOW_ROOF	real		none	
XWSNOW_ROAD	real		none	
XTSNOW_ROOF	real		none	
XTSNOW_ROAD	real		none	
XLWCSNOW_ROOF	real		none	
XLWCSNOW_ROAD	real		none	
XASNOW_ROOF	real		none	
XASNOW_ROAD	real		none	
XRSNOW_ROOF	real		none	
XRSNOW_ROAD	real		none	
LSNOW_IDEAL_TEB	logical		F	

- CSNOW_ROAD: snow scheme used over roads
- CSNOW_ROOF: snow scheme used over roofs
- CFILE_SNOW_TEB: name of the file used to define the snow profiles. The use of a file or prescribed value of XRSNOW_ROOF/ROAD, XTSNOW_ROOF/ROAD, XWSNOW_ROOF/ROAD and XASNOW_ROOF/ROAD has priority on the data in CFILE_SNOW_TEB file
- CTYPE_SNOW: type of the CFILE_SNOW_TEB file, if the latter is provided. CTYPE_SNOW must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "LFI ": LFI PREP file
  - "ASCII": ASCII PREP FILE
- CFILEPGD_SNOW_TEB: name of the associated PGD file if CFILE_SNOW_TEB is a PREP files.
- CTYPEPGD_SNOW: type of the CFILEPGD_SNOW
- XWSNOW_ROAD: snow reservoir for roads (kg/m^2)
- XWSNOW_ROOF: snow reservoir for roofs (kg/m^2)
- XTSNOW_ROAD: snow temperature for roads (K)
- XTSNOW_ROOF: snow temperature for roofs (k)
- XLWCSNOW_ROAD: snow liquid water content for roads (kg/m^3)
- XLWCSNOW_ROOF: snow liquid water content for roofs (kg/m^3)

- XRSNOW_ROOF: snow density for roofs (kg/m^3)
- XRSNOW_ROAD: snow density for roads (kg/m^3)
- XASNOW_ROAD: snow albedo for roads (-)
- XASNOW_ROOF: snow albedo for roofs (-)
- LSNOW_IDEAL_TEB: if LSNOW_IDEAL_TEB = F , only one value can be given for following snow parameters and a vertical interpolation is processed. If LSNOW_IDEAL_TEB = T, values are given for each layer and there is no vertical interpolation performed.

5.5.3 NAM_PREP_TEB_GARDEN

This namelist information is used to initialize the "GARDEN" vegetation scheme variables: soil temperature profile, soil water and ice profiles, water intercepted by leaves, snow.

Name	Type	Values	Default	X-Reference
XHUG_SURF_GD	real		none	
XHUG_ROOT_GD	real		none	
XHUG_DEEP_GD	real		none	
XHUGI_SURF_GD	real		none	
XHUGI_ROOT_GD	real		none	
XHUGI_DEEP_GD	real		none	
CFILE_HUG_SURF_GD	character(LEN=28)		CFILE_HUG_GD in this namelist	
CFILE_HUG_ROOT_GD	character(LEN=28)		CFILE_HUG_GD in this namelist	
CFILE_HUG_DEEP_GD	character(LEN=28)		CFILE_HUG_GD in this namelist	
CFILE_HUG_GD	character(LEN=28)		CFILE_GD in this namelist	
CTYPE_HUG	character(LEN=6)	'MESONH','GRIB', 'LFI','ASCII', 'ASCLLV'	CTYPE in this namelist	
XTG_SURF_GD	real		none	
XTG_ROOT_GD	real		none	
XTG_DEEP_GD	real		none	
CFILE_TG_SURF_GD	character(LEN=28)		CFILE_TG_GD in this namelist	
CFILE_TG_ROOT_GD	character(LEN=28)		CFILE_TG_GD in this namelist	
CFILE_TG_DEEP_GD	character(LEN=28)		CFILE_TG_GD in this namelist	
CFILE_TG_GD	character(LEN=28)		CFILE_GD in this namelist	
CTYPE_TG	character(LEN=6)	'MESONH','GRIB', 'LFI','ASCII', 'ASCLLV'	CTYPE in this namelist	
CFILE_GD	character(LEN=28)		CFILE in NAM_PREP_SURF_ATM	
CTYPE	character(LEN=6)	'MESONH','GRIB' 'ASCII','LFI'	CFILETYPE in NAM_PREP_SURF_ATM	
CFILEPGD_GD	character(LEN=28)		CFILEPGD in NAM_PREP_SURF_ATM	
CTYPEPGD	character(LEN=6)	'MESONH','ASCII' 'LFI'	CFILEPGDTYPE in NAM_PREP_SURF_ATM	

- XHUG_SURF_GD: uniform prescribed value of liquid soil water index (SWI) for the surface soil layer. This prescribed value, if defined, has priority on the use of CFILE_HUG_GD and CFILE_GD data.

- XHUG_ROOT_GD: uniform prescribed value of liquid soil water index (SWI) for the root zone soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GD and CFILE_GD data.
- XHUG_DEEP_GD: uniform prescribed value of liquid soil water index (SWI) for the deep soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GD and CFILE_GD data.
- XHUGI_SURF_GD: uniform prescribed value of ice soil water index (SWI) for the surface soil layer. This prescribed value, if defined, has priority on the use of CFILE_HUG_GD and CFILE_GD data.
- XHUGI_ROOT_GD :uniform prescribed value of ice soil water index (SWI) for the root zone soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GD and CFILE_GD data.
- XHUGI_DEEP_GD: uniform prescribed value of ice soil water index (SWI) for the deep soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GD and CFILE_GD data.
- CFILE_HUG_SURF_GD: name of the file used to define the liquid soil water index (SWI) for the surface soil layer.
- CFILE_HUG_ROOT_GD: name of the file used to define the liquid soil water index (SWI) for the root zone soil layer(s).
- CFILE_HUG_DEEP_GD: name of the file used to define the liquid soil water index (SWI) for the deep soil layer(s).
- CFILE_HUG_GD: name of the file used to define the soil water profiles.
  The use of a file or prescribed value of XHUG_SURF, XHUG_ROOT_GD and XHUG_DEEP_GD has priority on the data in CFILE_HUG_GD file.
- CTYPE_HUG: type of the CFILE_HUG_GD file, if the latter is provided. CTYPE_HUG must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII / LFI ": PREP file from Surfex
  - "ASCLLV": ASCII latlonval file (one file for each depth)
- XTG_SURF_GD: uniform prescribed value of temperature for the surface soil layer, supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG_GD and CFILE_GD data.
- XTG_ROOT_GD: uniform prescribed value of temperature for the root zone soil layer(s), supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG_GD and CFILE_GD data.

- XTG_DEEP_GD: uniform prescribed value of temperature for the deep soil layer(s), supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG_GD and CFILE_GD data.
- CFILE_TG_SURF_GD: name of the file used to define the surface soil temperature profile.
- CFILE_TG_ROOT_GD: name of the file used to define the root zone soil temperature profile.
- CFILE_TG_DEEP_GD: name of the file used to define the deep soil temperature profile.
- CFILE_TG_GD: name of the file used to define the soil temperature profile.
- The use of a file or prescribed value of XTG_SURF_GD, XTG_ROOT_GD and XTG_DEEP_GD has priority on the data in CFILE_TG_GD file.
- CTYPE_TG: type of the CFILE_TG_GD file, if the latter is provided. CTYPE_TG must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII / LFI ": PREP file from Surfex
  - "ASCLLV": ASCII latlonval file (one file for each depth)
- CFILE_GD / CFILEPGD_GD: name of the PREP / PGD files used to define any GARDEN variable. The use of a file or prescribed value XHUG_SURF_GD, XHUG_ROOT_GD, XHUG_DEEP_GD, XTG_SURF_GD, XTG_ROOT_GD, XTG_DEEP_GD, CFILE_WG_GD and CFILE_TG_GD has priority on the data in CFILE_GD file.
- CTYPE / CTYPEPGD: type of the CFILE_GD / CFILEPGD_GD files, if the latter is provided. CTYPE / CTYPEPGD must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII ": PREP/PGD Surfex ASCII file
  - "LFI ": PREP/PGD Surfex LFI file

5.5.4 NAM_PREP_GARDEN_SNOW

This namelist defines the type of snow scheme used in GARDEN scheme.

Name	Type	Values	Default	X-Reference
CSNOW_GD	character(LEN=3)	'D95', '3-L', 'EBA'	'D95'	
NSNOW_LAYER_GD	integer		1	
CFILE_SNOW_GD	character(LEN=28)		CFILE_GD in NAM_PREP_TEB_GARDEN	
CTYPE_SNOW	character(LEN=6)	'MESONH', 'GRIB ' 'LFI ' ,'ASCII '	CTYPE in NAM_PREP_TEB_GARDEN	
CFILEPGD_SNOW_GD	character(LEN=28)		CFILEPGD_GD in NAM_PREP_TEB_GARDEN	
CTYPEPGD_SNOW	character(LEN=6)	'MESONH', 'LFI ' 'ASCII'	CTYPEPGD in NAM_PREP_TEB_GARDEN	
LSNOW_IDEAL_GD	logical		F	
XWSNOW_GD	real(20)		0.	
XZSNOW_GD	real(20)		1.E+20	
XTSNOW_GD	real(20)		273.16	
XLWCSNOW_GD	real(20)		0.	
XRSNOW_GD	real(20)		300.	
XASNOW_GD	real		0.5	

- CSNOW_GD: type of snow scheme. Possible snow schemes are:
  - 'D95': Douville et al (1995) snow scheme.
  - '3-L': Boone and Etchevers (2000) three layers snow scheme.
  - 'EBA': Bogatchev and Bazile (2005), Arpege operational snow scheme.
- NSNOW_LAYER_GD: number of snow layers
- CFILE_SNOW_GD: name of the file used to define the snow profiles. The use of a file or prescribed value of XRSNOW_GD, XTSNOW_GD, XWSNOW_GD and XASNOW_GD has priority on the data in CFILE_SNOW_GD file
- CTYPE_SNOW: type of the CFILE_SNOW_GD file, if the latter is provided. CTYPE_SNOW must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "LFI ": LFI PREP file
  - "ASCII": ASCII PREP FILE
- CFILEPGD_SNOW_GD: name of the associated PGD file if CFILE_SNOW_GD is a PREP files.
- CTYPEPGD_SNOW: type of the CFILEPGD_SNOW file, if the latter is provided. CTYPEPGD_SNOW must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "LFI ": LFI PREP file
  - "ASCII": ASCII PREP FILE
- LSNOW_IDEAL_GD: if LSNOW_IDEAL_GD = F , only one value can be given for following snow parameters and a vertical interpolation is processed. If LSNOW_IDEAL_GD = T, values are given for each layer and there is no vertical interpolation performed.
- XWSNOW_GD: uniform value to initialize snow content, one for each layer (kg/m^2)

- XZSNOW_GD: uniform value to initialize snow depth, one for each layer (m) (alternative to XWSNOW_GD)
- XTSNOW_GD: uniform value to initialize snow temperature, one for each layer (K)
- XLWCSNOW_GD: uniform value to initialize liquid snow water contents, one for each layer (kg/m^3)
- XRSNOW_GD: uniform value to initialize snow density, one for each layer (kg/m^3)
- XASNOW_GD: uniform value to initialize snow albedo (-)

5.5.5 NAM_PREP_TEB_GREENROOF

This namelist information is used to initialize the "GREENROOF" vegetation scheme variables: soil temperature profile, soil water and ice profiles, water intercepted by leaves, snow.

Name	Type	Values	Default	X-Reference
XHUG_SURF_GR	real		none	
XHUG_ROOT_GR	real		none	
XHUG_DEEP_GR	real		none	
XHUGI_SURF_GR	real		none	
XHUGI_ROOT_GR	real		none	
XHUGI_DEEP_GR	real		none	
CFILE_HUG_SURF_GR	character(LEN=28)		CFILE_HUG_GR in this namelist	
CFILE_HUG_ROOT_GR	character(LEN=28)		CFILE_HUG_GR in this namelist	
CFILE_HUG_DEEP_GR	character(LEN=28)		CFILE_HUG_GR in this namelist	
CFILE_HUG_GR	character(LEN=28)		CFILE_GR in this namelist	
CTYPE_HUG	character(LEN=6)	'MESONH', 'GRIB ' 'LFI','ASCII', 'ASCLLV'	CTYPE in this namelist	
XTG_SURF_GR	real		none	
XTG_ROOT_GR	real		none	
XTG_DEEP_GR	real		none	
CFILE_TG_SURF_GR	character(LEN=28)		CFILE_TG_GR in this namelist	
CFILE_TG_ROOT_GR	character(LEN=28)		CFILE_TG_GR in this namelist	
CFILE_TG_DEEP_GR	character(LEN=28)		CFILE_TG_GR in this namelist	
CFILE_TG_GR	character(LEN=28)		CFILE_GR in this namelist	
CTYPE_TG	character(LEN=6)	'MESONH','GRIB', 'LFI','ASCII ', 'ASCLLV'	CTYPE in this namelist in this namelist	
CFILE_GR	character(LEN=28)		CFILE in NAM_PREP_SURF_ATM	
CTYPE	character(LEN=6)	'MESONH', 'GRIB ' 'ASCII ','LFI '	CFILETYPE in NAM_PREP_SURF_ATM	
CFILEPGD_GR	character(LEN=28)		CFILEPGD in NAM_PREP_SURF_ATM	
CTYPEPGD	character(LEN=6)	'MESONH', 'ASCII ' 'LFI '	CFILEPGDTYPE in NAM_PREP_SURF_ATM	

- XHUG_SURF_GR: uniform prescribed value of liquid soil water index (SWI) for the surface soil layer. This prescribed value, if defined, has priority on the use of CFILE_HUG_GR and CFILE_GR data.

- XHUG_ROOT_GR: uniform prescribed value of liquid soil water index (SWI) for the root zone soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GR and CFILE_GR data.
- XHUG_DEEP_GR: uniform prescribed value of liquid soil water index (SWI) for the deep soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GR and CFILE_GR data.
- XHUGI_SURF_GR: uniform prescribed value of ice soil water index (SWI) for the surface soil layer. This prescribed value, if defined, has priority on the use of CFILE_HUG_GR and CFILE_GR data.
- XHUGI_ROOT_GR :uniform prescribed value of ice soil water index (SWI) for the root zone soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GR and CFILE_GR data.
- XHUGI_DEEP_GR: uniform prescribed value of ice soil water index (SWI) for the deep soil layer(s). This prescribed value, if defined, has priority on the use of CFILE_HUG_GR and CFILE_GR data.
- CFILE_HUG_SURF_GR: name of the file used to define the liquid soil water index (SWI) for the surface soil layer.
- CFILE_HUG_ROOT_GR: name of the file used to define the liquid soil water index (SWI) for the root zone soil layer(s).
- CFILE_HUG_DEEP_GR: name of the file used to define the liquid soil water index (SWI) for the deep soil layer(s).
- CFILE_HUG_GR: name of the file used to define the soil water profiles.
  The use of a file or prescribed value of XHUG_SURF, XHUG_ROOT_GR and XHUG_DEEP_GR has priority on the data in CFILE_HUG_GR file.
- CTYPE_HUG: type of the CFILE_HUG_GR file, if the latter is provided. CTYPE_HUG must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII / LFI ": PREP file from Surfex
  - "ASCLLV": ASCII latlonval file (one file for each depth)
- XTG_SURF_GR: uniform prescribed value of temperature for the surface soil layer, supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG_GR and CFILE_GR data.
- XTG_ROOT_GR: uniform prescribed value of temperature for the root zone soil layer(s), supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG_GR and CFILE_GR data.

- XTG_DEEP_GR: uniform prescribed value of temperature for the deep soil layer(s), supposed at an altitude of 0m (mean sea level altitude). The temperature is then modified for each point depending on its altitude, following a uniform vertical gradient of -6.5 K km-1. This prescribed value, if defined, has priority on the use of CFILE_TG_GR and CFILE_GR data.
- CFILE_TG_SURF_GR: name of the file used to define the surface soil temperature profile.
- CFILE_TG_ROOT_GR: name of the file used to define the root zone soil temperature profile.
- CFILE_TG_DEEP_GR: name of the file used to define the deep soil temperature profile.
- CFILE_TG_GR: name of the file used to define the soil temperature profile.
  The use of a file or prescribed value of XTG_SURF_GR, XTG_ROOT_GR and XTG_DEEP_GR has priority on the data in CFILE_TG_GR file.
- CTYPE_TG: type of the CFILE_TG_GR file, if the latter is provided. CTYPE_TG must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII / LFI ": PREP file from Surfex
  - "ASCLLV": ASCII latlonval file (one file for each depth)
- CFILE_GR / CFILEPGD_GR: name of the PREP / PGD files used to define any GARDEN variable. The use of a file or prescribed value XHUG_SURF_GR, XHUG_ROOT_GR, XHUG_DEEP_GR, XTG_SURF_GR, XTG_ROOT_GR, XTG_DEEP_GR, CFILE_WG_GR and CFILE_TG_GR has priority on the data in CFILE_GR file.
- CTYPE / CTYPEPGD: type of the CFILE_GR / CFILEPGD_GR files, if the latter is provided. CTYPE / CTYPEPGD must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "ASCII ": PREP/PGD Surfex ASCII file
  - "LFI ": PREP/PGD Surfex LFI file

5.5.6 NAM_PREP_GREENROOF_SNOW

This namelist defines the type of snow scheme used in GARDEN scheme.

Name	Type	Values	Default	X-Reference
CSNOW_GR	character(LEN=3)	'D95','3-L','EBA'	'3-L'	
NSNOW_LAYER_GR	integer		3	
CFILE_SNOW_GR	character(LEN=28)		CFILE_GR in NAM_PREP_TEB_GREENROOF	
CTYPE_SNOW	character(LEN=6)	'MESONH','GRIB' 'LFI','ASCII'	CTYPE in NAM_PREP_TEB_GREENROOF	
CFILEPGD_SNOW_GR	character(LEN=28)		CFILEPGD_GR in NAM_PREP_TEB_GREENROOF	
CTYPEPGD_SNOW	character(LEN=6)	'MESONH','LFI' 'ASCII'	CTYPEPGD in NAM_PREP_TEB_GREENROOF	
LSNOW_IDEAL_GR	logical		F	
XWSNOW_GR	real(20)		0.	
XZSNOW_GR	real(20)		1.E+20	
XTSNOW_GR	real(20)		273.16	
XLWCSNOW_GR	real(20)		0.	
XRSNOW_GR	real(20)		300.	
XASNOW_GR	real		0.5	

- CSNOW_GR: type of snow scheme. Possible snow schemes are:
  1. 'D95': Douville et al (1995) snow scheme.
  2. '3-L': Boone and Etchevers (2000) three layers snow scheme.
  3. 'EBA': Bogatchev and Bazile (2005), Arpege operational snow scheme.
- NSNOW_LAYER_GR: number of snow layers
- CFILE_SNOW_GR: name of the file used to define the snow profiles. The use of a file or prescribed value of XRSNOW_GR, XTSNOW_GR, XWSNOW_GR and XASNOW_GR has priority on the data in CFILE_SNOW_GR file
- CTYPE_SNOW: type of the CFILE_SNOW_GR file, if the latter is provided. CTYPE_SNOW must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "GRIB ": the file type is a GRIB file, coming from any of these models:
    1. "ECMWF ": european center forecast model
    2. "ARPEGE": Arpege french forecast model
    3. "AROME": Arome french forecast local model
    4. "MOCAGE": Mocage french research chemistry model
  - "LFI ": LFI PREP file
  - "ASCII": ASCII PREP FILE
- CFILEPGD_SNOW_GR: name of the associated PGD file if CFILE_SNOW_GR is a PREP files.
- CTYPEPGD_SNOW: type of the CFILEPGD_SNOW file, if the latter is provided. CTYPEPGD_SNOW must then be given. The following values are currently usable:
  - "MESONH": the file type is a MESONH file.
  - "LFI ": LFI PREP file
  - "ASCII": ASCII PREP FILE
- LSNOW_IDEAL_GR: if LSNOW_IDEAL_GR = F , only one value can be given for following snow parameters and a vertical interpolation is processed. If LSNOW_IDEAL_GR = T, values are given for each layer and there is no vertical interpolation performed.
- XWSNOW_GR: uniform value to initialize snow content, one for each layer

- XZSNOW_GR: uniform value to initialize snow depth, one for each layer (m)
- XTSNOW_GR: uniform value to initialize snow temperature, one for each layer
- XLWCSNOW_GR: uniform value to initialize snow liquid water content, one for each layer (kg/m3)
- XRSNOW_GR: uniform value to initialize snow density, one for each layer
- XASNOW_GR: uniform value to initialize snow albedo

6 Running the models

6.1 "SURF_ATM" general options

Available over all tiles.

6.1.1 NAM_SURF_CSTS

Name	Type	Values	Default Reprod_Oper/Not	X-Reference
XEMISSN	real		1.0 /0.99	
XANSMIN	real		0.5	
XANSMAX	real		0.85	
XAGLAMIN	real		0.8	
XAGLAMAX	real		0.85	
XALBWAT	real		0.135/0.065	
XALBCOEF_TA96	real		0.037	
XALBSCA_WAT	real		0.06	
XEMISWAT	real		0.98/0.96	
XALBWATICE	real		0.85/0.40	
XEMISWATICE	real		1.0/0.97	
XHGLA	real		33.3	
XWSNV	real		5.0	
XCFFV	real		4.0	
XZ0SN	real		0.001	
XZ0HSN	real		0.0001	
XTAU_SMELT	real		300.	
XALBSEAICE	real		0.85/0.71	
XZ0FLOOD	real		0.0002	
XALBWATSNOW	real		0.85/0.60	
XTAU_LW	real		0.5	

- XEMISSN: snow emissivity (default depends of LREPROD_OPER flag)
- XANSMIN: minimum value for snow albedo
- XANSMAX: maximum value for snow albedo
- XAGLAMIN: minimum value for permanent snow/ice albedo
- XAGLAMAX: maximum value for permanent snow/ice albedo
- XALBWAT: water direct albedo (default depends of LREPROD_OPER flag)
- XALBCOEF_TA96: coefficient used in th computation of albedo if 'TA96' option selected
- XALBSCA_WAT: water diffuse albedo
- XEMISWAT: water emissivity (default depends of LREPROD_OPER flag)
- XALBWATICE: water ice albedo (default depends of LREPROD_OPER flag)
- XEMISWATICE: sea ice emissivity (default depends of LREPROD_OPER flag)
- XHGLA: Height of aged snow in glacier case (allows Pn=1)
- XWSNV: Coefficient for calculation of snow fraction over vegetation
- XZ0SN: roughness length of pure snow surface (m)
- XZ0HSN:roughness length for heat of pure snow surface (m)

- XTAU_SMELT: snow melt timescale with D95 (s): needed to prevent time step dependence of melt when snow fraction < unity.
- XCFFV: Coefficient for calculation of floodplain fraction over vegetation
- XALBSEAICE: sea ice albedo (default depends of LREPROD_OPER flag)
- XZ0FLOOD: flood z0
- XALBWATSNOW: snow albedo over water bodies or lakes (default depends of LREPROD_OPER flag)
- XTAU_LW: Extinction coefficient for view factor for long-wave radiation

6.1.2 NAM_SURF_ATM

Name	Type	Values	Default	X-Reference
XCISMIN	real		6.7E-5	
XVMODMIN	real		0.	
LALDTHRES	logical		F	
LDRAG_COEF_ARP	logical		F	
LALDZ0H	logical		F	
LNOSOF	logical		T	
LSLOPE	logical		F	
LCPL_GCM	logical		F	
XEDB	real		5.	
XEDC	real		5.	
XEDD	real		5.	
XEDK	real		1.	
XUSURIC	real		1.	
XUSURID	real		0.035	
XUSURICL	real		4.	
XVCHRNK	real		0.015	
XVZ0CM	real		0.0	
XDELTA_MAX	real		1.0	
XRIMAX	real		0.2	
LVERTSHIFT	logical		F	
LVZIUSTAR0_ARP	logical		F	
LRRGUST_ARP	logical		F	
XVZIUSTAR0	real		0.	
XRZHZ0M	real		1.	
XRRSCALE	real		1.15E-4	
XRRGAMMA	real		0.8	
XUTILGUST	real		0.125	
LCPL_ARP	logical		F	
LQVNPLUS	logical		F	
LVSHIFT_LW	logical		F	
LVSHIFT_PRCP	logical		F	
XCO2UNCPL	real		'none'	
LARP_PN	logical		F	
LCO2FOS	logical		F	

- LALDTHRES: flag to set a minimum wind and shear like done in Arpege model.
- XCISMIN: minimum wind shear to compute turbulent exchange coefficient (used only if LALDTHRES)
- XVMODMIN: minimum wind speed to compute turbulent exchange coefficient (used only if LALDTHRES)
- LDRAG_COEF_ARP: to use drag coefficient computed like in Arpege models

- LALDZ0H: to take into account orography in heat roughness length
- LNOSOF: no parameterization of subgrid orography effects on atmospheric forcing
- LSLOPE: If True, correct parameterization of incoming radiations for homogeneous explicit slopes. If True, LNOSOF=F.
- LCPL_GCM: flag used to red/write precipitation forcing from/into the erstart file for ARPEGE run
- XEDB, XEDC, XEDD, XEDK: coefficients used in Richardson critical numbers computation
- XUSURIC, XUSURID, XUSURICL: Richardson critical numbers
- XVCHRNK, XVZ0CM: Charnock's constant and minimal neutral roughness length over sea (formulation of roughness length over sea)
- XDELTA_MAX: maximum fraction of the foliage covered by intercepted water for high vegetation
- XRIMAX: limitation of Richardson number in drag computation
- LVERTSHIFT: vertical shifth from atmospheric orography to surface orography
- LVZIUSTAR0_ARP: flag to activate arpege formulation for zoh over sea
- LRRGUST_ARP: flag to activate the correction of CD, CH, CDN due to moist gustiness
- XVZIUSTAR0: arpege formulation for zoh over sea
- XRZHZ0M: arpege formulation for zoh over sea
- XRRSCALE: arpege formulation for zoh over sea
- XRRGAMMA: arpege formulation for zoh over sea
- XUTILGUST: correction of CD, CH, CDN due to moist gustiness
- LCPL_ARP: activate arpege formulation for Cp and L
- LQVNPLUS: An option for the resolution of the surface temperature equation (Arpege)
- LVSHIFT_LW: flag to activate/deactivate vertical shift for LongWave radiations
- LVSHIT_PRCP: flag to activate/deactivate vertical shift for Precip
- XCO2UNCPL: key for decoupling between CO2 employed for photosynthesis and radiative CO2 (in ppmv).
- LARP_PN: Activate ARPEGE PN values for Cv and TAU_ICE
- LCO2FOS: if activated, add fossil fuel emissions to natural CO2 emissions from ISBA

6.1.3 NAM_WRITE_SURF_ATM

Name	Type	Values	Default	X-Reference
LNOWRITE_CANOPY	logical		F	
LNOWRITE_TEXFILE	logical		F	
LSPLIT_PATCH	logical		T	

- LNOWRITE_CANOPY: if T, do not write canopy prognostic variables in initial/restart or LBC files
- LNOWRITE_TEXFILE: if T, do not fill class_cover_data.tex file during the model setup
- LSPLIT_PATCH: T by default, setting FALSE it writes output fields 2D, with the dimension PATCH, like before.

6.1.4 NAM_SSOn

Name	Type	Values	Default	X-Reference
CROUGH	character(LEN=4)	'Z01D', 'Z04D', 'NONE', 'BE04'	BE04	
XFRACZ0	real		2.	
XCOEFBE	real		2.	
LDSV	logical		F	
LDSH	logical		F	
LDSL	logical		F	

- CROUGH: type of orographic roughness length. The following options are currently available:
  - "Z01D": orographic roughness length does not depend on wind direction
  - "Z04D": orographic roughness length depends on wind direction
  - "BE04": Beljaars 2004 orographic drag
- "NONE": no orographic treatment
- XFRACZ0: Z0=min(Z0, Href/XFRACZ0)
- XCOEFBE: coefficient for Beljaars calculation of SSO drag.
- LDSV : orographic shadowing, sky view factor (only if LORORAD = T in PGD field)
- LDSH : orographic shadowing, shadow factor (only if LORORAD = T in PGD field)
- LDSL : orographic shadowing, slope factor (only if LORORAD = T in PGD field)

6.1.5 NAM_REPROD_OPER

Name	Type	Values	Default	X-Reference
LREPROD_OPER	logical	F/T	F	
XEVERG_RSMIN	real	175./250.	175.	
XEVERG_VEG	real	1./0.99	1.	
CDGAVG	character(LEN=3)	'INV'/'ARI'	'INV'	
CDGDIF	character(LEN=4)	'ROOT' /'SOIL'	'ROOT'	
CIMPLICIT_WIND	character(LEN=3)		'OLD'/'NEW'	
CQSAT	character(LEN=3)	'NEW'/'OLD'	'NEW'	
CCHARNOCK	character(LEN=3)	'NEW'/'OLD'	'NEW'	

- LREPROD_OPER: flag to activate reproductibility for SURFEX OPER. Allow to put old value/flag for some variables in order to ensure reproducibility. Default values for following entries depend on LREPROD_OPER (F/T).
- XEVERG_RSMIN: Rsmin for tropical forest
- XEVERG_VEG: Veg fraction for tropical forest
- CDGAVG:
  - "INV": compute harmonic average for Soil depth (recommended)
  - "ARI": old computation of Soil depth using arithmetic average
- CDGDIF :
  - "ROOT": d2 root depth as Soil depth reference for ISBA-DF (recommended)
  - "SOIL": d3 soil depth as Soil depth reference for ISBA-DF
- CIMPLICIT_WIND: wind implicitation
  - OLD: direct

  - NEW: Tayler serie, order 1

- CQSAT :
  - "NEW": qsat computation accounting for phase change. If temperature is <0.°C compute it using ice properties instead of using water properties. (recommended)
  - "OLD": qsat computation only accounting for water properties.

- CCHARNOCK :
  - "NEW": charnock number vary between 0.011 et 0.018 according to Chris Fairalls data as in coare3.0 (recommended)
  - "OLD": charnock number = XVCHRNK

6.2 "SEAFLUX" parameterization options

Sea tile.

6.2.1 NAM_SEAFLUXn

Name	Type	Values	Default	X-Reference
CSEA_FLUX	character(LEN=6)	'DIRECT', 'ITERAT' 'COARE3', 'ECUME ' 'ECUME6', 'WASPV1'	'ECUME6 '	
CSEA_ALB	character(LEN=4)	'UNIF', 'TA96' 'MK10', 'RS14'	'TA96'	
LPWG	logical		F	
LPRECIP	logical		F	
LPWEBB	logical		F	
LPROGSST	logical		F	
XOCEAN_TSTEP	real			
CINTERPOL_SST	character(LEN=6)	'LINEAR', 'UNIF' 'QUADRA', 'NONE ' 'READAY'	'NONE '	
CINTERPOL_SSS	character(LEN=6)	'LINEAR', 'UNIF' 'QUADRA', 'NONE ' 'READAY'	'NONE '	
XICHCE	real		0.	
CSEA_SFCO2	character(LEN=4)	'NONE', 'WIND'	'NONE'	
NGRVWAVES	integer	0, 1, 2	0	
NZ0	integer	0, 1, 2	0	
LPERTFLUX	logical		F	
LWAVEWIND	logical		T	

- CSEA_FLUX: type of flux computation physics. The following options are currently available:
  - "DIRECT": direct Charnock computation from Louis (1979). No effect of convection in the the boundary layer on the fluxes formulae.
  - "ITERAT": iterative method proposed by Fairall et al (1996) from TOGA-COARE experiment, amended by Mondon and Redelsperger (1998) to take into account effect of atmospheric convection on fluxes.
  - "COARE3": the COARE 3.0 iterative method proposed by Fairall et al (2003).
  - "ECUME ": iterative method proposed by Fairall et al (1996) from TOGA-COARE experiment, amended by cnrm/memo to take into account effect of atmospheric convection, precipitation and gustiness on fluxes: improvement of surface exchange coefficients representation.

  - "ECUME6 ": to activate new ecumev6
  - "WASPV1": iterative bulk algorithm based on Fairall et al (2003) modified to take the wind-sea peak period into account.
- LPWG: correction of fluxes due to gustiness
- LPRECIP: correction of fluxes due to precipitation
- LPWEBB:correction of fluxes due to convection (Webb effect)
- CSEA_ALB: type of albedo formula. The following options are currently available:
  - "UNIF": a uniform value of 0.135 is used for water albedo
  - "TA96": Taylor et al (1996) formula for water direct albedo, depending on solar zenith angle
  - "MK10": albedo from Marat Khairoutdinov
  - "RS14": albedo based on Morel and Gentilli 1991 and Salisbury 2014 eq(2)
- LPROGSST: set it to T to make SST evolve with tendency when using the 1d oceanic model
- XOCEAN_TSTEP: timestep for ocean model
- CINTERPOL_SST: interpolate monthly SST to daily SST
  - LINEAR: Linear interpolation between 3 months. Current value is reached every 16 of each month, except in February every 15.
  - UNIF: uniform SST
  - QUADRA: Quadractic interpolation between 3 months, especially relevant to conserve the SST (or other) monthly mean value.
  - READAY: impose directly daily SST
- CINTERPOL_SSS: interpolate monthly Sea Surface Salinity to daily SSS, used by ECUME6 and/or Gelato
  - LINEAR: Linear interpolation between 3 months. Current value is reached every 16 of each month, except in February every 15.
  - UNIF: uniform SSS
  - QUADRA: Quadractic interpolation between 3 months, especially relevant to conserve the SSS monthly mean value.
  - READAY: impose directly daily SSS
- XICHCE: coefficient used in the Ecume formulation (computation of exchange coefficients over sea)
- CSEA_SFCO2: Empirical CO2 emission from sea surface
  - NONE : no emission
  - WIND : Wanninkhof medium hypothesis using only wind speed as CO2 emission proxy (very empirical)
- NRGVWAVES: Wave gravity in roughness length in coare30_flux
  - 0: no gravity waves action (Charnock)
  - 1: wave age parameterization of Oost et al. 2002
  - 2: model of Taylor and Yelland 2001
- NZ0: to choose PZ0SEA formulation in ECUME6

  - 0: ARPEGE formulation
  - 1: Smith (1988) formulation
  - 2: Direct computation using the stability functions

- LPERTFLUX: True = stochastic flux perturbation of Ecume
- LWAVEWIND: True for wave parameters computed from wind (default), put to False to take Hs or Tp values if initialized in PREP or if coupled.

6.2.2 NAM_SURF_SLT

Name	Type	Values	Default	X-Reference
CEMISPARAM_SLT	character(LEN=5)	'Vig01','Sch04'	'Vig01'	

- "CEMISPARAM_SLT": One-line sea salt emission parameterization type. This namelist gives the distribution of emitted sea salt of SURFEX. For Each paramterization type, a geometric standard deviation and a median radius is given. See the code init_sltn.f90 (MesoNH) or init_sltn.mnh (AROME, ALADIN) for values associated to these parameterizations. Note that if the defaut value is change, it is necessary to uses the same modes in the sea initialisation in the atmospheric model. It concerns the value of XINIRADIUS_SLT (initial radius), XINISIG_SLT (standard deviation) and CRGUNITS (mean radius definition) to have the same aerosol size distribution emitted and in the atmosphere. It is possible to do it directly in the fortran code (modd_salt.mnh in case of aladin/arome, modd_salt.f90 for MesoNH) or for MesoNH only, change the values of these variables in NAM_AERO_CONF (prep_real_case or prep_ideal_case).

6.2.3 Sea-ice schemes

From Version 8, Surfex handles sea-ice either :

Report on implementing sea-ice schemes and Gelato in Surfex

- by using sea-ice cover forcing data from PREP file
- or by activating a sea-ice prognostic scheme.

This allows to compute surface fluxes which are much more realistic than when using only Sea Surface Temperature (SST). A report on this development is available in scientific documentation.

A sea-ice scheme is activated at the PREP stage using parameter CSEAICE_SCHEME of NAM_PREP_SEAFLUX. It also involves some settings in the relevant namelist: Namelist NAM_SEAICEn. A sea-ice scheme must be provided with Sea Surface Temperature (SST), and Salinity (SSS) fields, in a way described in namelist NAM_SEAFLUXn.

When a sea-ice scheme is not activated, sea-ice cover is anyway handled if CINTERPOL_SIC /='NONE' in NAM_SEAICEn , then :

- sea-ice cover forcing data must be provided in the PREP file
- sea surface temperature is used as sea-ice temperature on locations where sea-ice cover is not zero
- a constant sea-ice albedo is used (see XCST_ICE_ALB in in namelist NAM_SEAICEn)

In both cases :

- there are two options for turbulent exchange coefficient calculation over sea-ice (see XCD_ICE_CST in namelist NAM_SEAICEn)
- sea-ice concentration becomes a prognostic field (named SIC)

- all usual SEA scheme diagnostics (as e.g. LE_SEA, LEI_SEA, CD_SEA, SWU_SEA, FMV_SEA, Z0_SEA) then represent the linear weigthing of open sea and sea-ice values (weighted by sea-ice cover)
- the same diagnostics are provided for sea-ice only (e.g. LE_SEAICE)

The Gelato sea-ice prognostic scheme is the only sea-ice scheme yet managed with NAM_SEAICEn. It is described in section Gelato sea-ice scheme.

6.2.4 Gelato sea-ice scheme

Please read first section Sea-ice schemes 6.2.3

Gelatos implementation in Surfex is the restriction to a 1D thermodynamical setting of the full Gelato sea-ice model (D.Salas y Melia, 2002) and was implemented in Surfex Version 8. In the following, some namelist paramaters are quoted. See Namelist NAM_SEAICEn for more details.

Gelato can optionnally be constrained by a Sea Ice Cover (SIC) field (either using explicit fields or through implicit values derived from SST - see XFREEZING_SST), and/or with Sea Ice Thickness fields. Gelato time step can be set as different from the SEAFLUX time step (see XSEAICE_TSTEP). The bathymetry prescribed by NAM_BATHY is used by Gelato.

Constraining Gelato with Sea Ice Cover and/or Thickness:

If you set the value of namelist parameter XSIC_EFOLDING_TIME (resp. XSIT_EFOLDING_TIME) to any value > 0, Gelato will use a provided (or computed) SIC field (resp. the provided SIT field) as a constraint; the namelist parameter is then interpreted as a relaxation time (expressed in days, possibly fractional) for damping toward this constraint; default value is 0. and means no relaxation.

Having these constraint fields evolve during the simulation is possible using namelist parameters CINTERPOL_SIC and CINTERPOL_SIT, with values "MONTH" or "ANNUAL", which means that a 3-values, quadratic time interpolation will be done using the 3 among 3 (resp 3 among 14) monthly fields found in PREP file. Feeding the data in the PREP files assumes the use of some binary such as 'updsst/updcli' (for PREP in FA format), external to the Surfex run(s). This time evolution scheme is based on the scheme devised for SST

Constraining Gelatos Sea-ice Cover using only Sea Surface Temperature fields:

The sea-ice constraint field, if not provided as described above, will be derived from the SST field; hence :

- This implies to define which provided SST forcing values do mean that the sea reaches its freezing point, and/or SIC is not zero.
- Sea freezing point actually depends on sea surface salinity, which varies in space and time, but sea surface analysis data sets usually provide SST only, and represents that SIC is non-zero by using a constant, arbitrary SST on the relevant data points (as e.g. -1.8 Celsius in HadSST1 data).
- Hence, the Surfex user will then have to set the value of namelist parameter XFREEZING_SST (in Celsius) to tell Surfex which is this arbitrary SST, or more precisely to enforce that data points with time-interpolated SST $\leq$ XFREEZING_SST are considered to be at the freezing point for their current salinity value, and show a SIC value of 1 (i.e. 100 %).
- Default value for XFREEZING_SST is -1.8 Celsius
- The same scheme applies whatever the way SST does evolve in Surfex (either using the 1D ocean mixing model -with or without relaxation- or using one of the ways to provide forcing SST fields)

6.2.5 NAM_SEAICEn

Please read first section Sea-ice schemes.

When a letter shows in first column, the settings described will apply only under a given condition :

- "G": apply if an explicit sea-ice scheme is set in PREP (e.g. GELATO)

Name	Type	Values	Default	X-Reference
CINTERPOL_SIC	character(LEN=6)	'NONE','UNIF' 'LINEAR','READAY'	'NONE'	
XCD_ICE_CST	float		0 (bulk)	
LDIAG_MISC_SEAICE	logical		T	
XSEAICE_TSTEP	float		SEA_TSTEP	
XSI_FLX_DRV	float		-20.	
XSIC_EFOLDING_TIME	float		0.	
CINTERPOL_SIT	character(LEN=6)	'NONE','UNIF' 'LINEAR','READAY'	'NONE '	
XSIT_EFOLDING_TIME	float	$\geq 0.$	0.	
XFREEZING_SST	float		-1.8	

- CINTERPOL_SIC: Type of interpolation of Sea Ice cover external fields. This applies whatever the role of these external fields: constraint fields (when CSEAICE_SCHEME=GELATO) or forcing fields (when value is CSEAICE_SCHEME=NONE and some interpolation is set)
  - LINEAR: linear interpolation between 3 months
  - READAY: impose directly daily SIC (sea ice cover)
- XCD_ICE_CST: Turbulent exchange coefficient value for drag, heat and vapor on sea-ice. Default is 0 and means: apply a bulk formula.
- LDIAG_MISC_SEAICE: should we output sea-ice diagnostics ? default to T is sea-ice cover is handled

Following keys: only if GELATO is activated

- XSEAICE_TSTEP: Time step (in s) for the Gelato sea-ice scheme. If not set, use the same time step as the SEA scheme
- XSI_FLX_DRV: Derivative of the non-solar fluxes w.r.t. sea-ice temperature (in $W.m^{-2}.K^{-1}$). Allows Gelato to compute this flux on various ice categories, as long as Surfex handles only one sea-ice category.
- XSIC_EFOLDING_TIME: If ≥ 0, a damping of sea-ice cover will occur in Gelato, with this e-folding time (in days). The sea-ice cover constraint is the data provided in the PREP file, interpolated in time according to CINTERPOL_SIC setting, or, as a default, the interpretation of SST data using XFREEZING_SST. [note for Gelato wizzards: the Surfex default Gelato option for damping is "MONO"]
- CINTERPOL_SIT: Type of interpolation of Sea Ice thickness constraint, in Gelato.
  - READAY: impose directly daily SIT (sea ice thickness)
- XSIT_EFOLDING_TIME: If ≥ 0, a damping of sea-ice thickness will occur in Gelato, with this e-folding time (in days). The sea-ice thickness constraint is the data provided in the PREP file [note for Gelato wizzards: the Surfex default Gelato option for damping is "MONO_ADD"]
- XFREEZING_SST: Arbitrary SST freezing point (in Celsius). Indicates where the SST data you provide can be interpreted by Gelato as locations covered with sea-ice, if no SIC constraint field is provided. SST passed to Gelato will also anyway then be set there to the actual, salinity-dependant, freezing point.

6.3 "WATFLUX" and "FLAKE" parameterization options

Inland water tile.

6.3.1 NAM_WATFLUXn

Name	Type	Values	Default	X-Reference
CINTERPOL_TS	character(LEN=6)	'LINEAR', 'UNIF' 'QUADRA', 'NONE '	'NONE '	
CWAT_ALB	character(LEN=4)	'UNIF', 'TA96'	'UNIF'	

- CWAT_ALB: type of formulation used to set albedo over water
- CINTERPOL_TS: interpolate monthly TS to daily TS
  - LINEAR: Linear interpolation between 3 months.Current value is reached evry 16 of each month, except in February every 15.
  - UNIF: uniform TS
  - QUADRA: quadractic interpolation between 3 months, especially relevant to conserv the TS monthly mean value.

6.3.2 NAM_FLAKEn

Name	Type	Values	Default	X-Reference
LSEDIMENTS	logical		T	
CSNOW_FLK	character(LEN=3)	'DEF'	'DEF'	
CFLK_FLUX	character(LEN=3)	'FLAKE', 'DEF '	'DEF'	
CFLK_ALB	character(LEN=4)	'UNIF', 'TA96 ','MK10'	'UNIF'	
LSKINTEMP	logical		F	

- LSEDIMENTS: to use the bottom sediments scheme of Flake (default)
- CSNOW_FLK: snow scheme to be used. For the time being only option 'DEF' is active
- CFLK_FLUX: scheme to be used to compute surface fluxes of moment, energy and water vapor:
  - 'DEF' to activate the classic watflux
  - 'FLAKE' to use flake parameterization
- CFLK_ALB:type of albedo for FLake.
  - 'UNIF': a uniform value of 0.135 is used for water albedo
  - 'TA96': Taylor et al (1996) formula for water direct albedo, depending on solar zenith angle
  - 'MK10': albedo from Marat Khairoutdinov
- LSKINTEMP: flag to use or not the skin temperature computation.

6.3.3 NAM_CH_FLAKEn

Name	Type	Values	Default	X-Reference
CCH_DRY_DEP	character(LEN=6)	'WES89', 'NONE'	'WES89'	

- CCH_DRY_DEP: deposition scheme ('WES89': Wesley method)

6.4 "ISBA" parameterization options

Nature tile.

6.4.1 NAM_SGH_ISBAn

Name	Type	Values	Default	X-Reference
CRUNOFF	character(LEN=4)	'WSAT', 'DT92' , 'SGH', 'TOPD'	'WSAT'	
CKSAT	character(LEN=4)	'DEF', 'SGH','EXP'	'DEF'	
LSOC	logical		F	
CRAIN	character(LEN=3)	'DEF', 'SGH'	'DEF'	
CHORT	character(LEN=4)	'DEF ', 'SGH'	'DEF '	

- CRUNOFF: type of subgrid runoff. The following options are currently available:
  - 'WSAT': runoff occurs only when saturation is reached
  - 'DT92': Dumenill and Todini (1992) subgrid runoff formula
  - 'SGH ': Decharme et al. (2006) Topmodel like subgrid runoff
  - 'TOPD': if LCOUPL_TOPD=T, allows that DUNNE runoff contains only saturated pixels on meshes so only catchments
- CKSAT: Activates the exponential profile for Ksat. The following options are currently available:
  - 'DEF': homogeneous profile
  - 'SGH': exponential decreasing profile with depth (due to compaction of soil)
  - 'EXP': with CISBA='3-L' and LCOUPL_TOPD=T, allows to read a file containing values for the F parameter, computed by topmodel during PGD.
- LSOC: to activate soil organic carbon effect.
- CRAIN: Activates the spatial distribution of rainfall intensity. The following options are currently available:
  - 'DEF': homogeneous distribution
  - 'SGH': exponential distribution which depends on the fraction of the mesh where it rains. This fraction depends on the mesh resolution and the intensity of hourly precipitation. (If the horizontal mesh is lower than 10km then the fraction equals 1).
- CHORT: Activates the Horton runoff due to water infiltration excess. The following options are currently available:
  - 'DEF': no Horton runoff
  - 'SGH': Horton runoff computed

6.4.2 NAM_ISBAn

Name	Type	Values	Default	X-Reference
CC1DRY	character(LEN=4)	'DEF ', 'GB93'	'DEF '	
CSCOND	character(LEN=4)	'NP89', 'PL98'	'PL98'	
CSOILFRZ	character(LEN=3)	'DEF', 'LWT'	'DEF'	
CDIFSFCOND	character(LEN=4)	'DEF ', 'MLCH'	'DEF '	
CSNOWRES	character(LEN=3)	'DEF', 'RIL', 'M98'	'DEF'	
CCPSURF	character(LEN=3)	'DRY', 'HUM'	'DRY'	
XTSTEP	real		none	
XCVHEATF	real		0.20	
XCGMAX	real		2.E-5	
XCDRAG	real		0.15	
LGLACIER	logical		F	
LCANOPY_DRAG	logical		F	
LVEGUPD	logical		T	
LPERTSURF	logical		T	

- CC1DRY: type of C1 formulation for dry soils. The following options are currently available:
  - 'DEF ': Giard-Bazile formulation
  - 'GB93': Giordani 1993, Braud 1993
- CSCOND: type of thermal conductivity. The following options are currently available:
  - 'NP89': Noilhan and Planton (1989) formula
  - 'PL98': Peters-Lidard et al. (1998) formula
- CSOILFRZ: type of soil freezing-physics option. The following options are currently available:
  - 'DEF': Boone et al. 2000; Giard and Bazile 2000
  - 'LWT': Phase changes as above, but relation between unfrozen water and temperature considered
- CDIFSFCOND: type of Mulch effects. The following options are currently available:
  - 'DEF ': no mulch effect
  - 'MLCH': include the insulating effect of leaf litter/mulch on the surf. thermal cond.
- CSNOWRES: type of turbulent exchanges over snow. The following options are currently available:
  - 'DEF': Louis
  - 'RIL': Maximum Richardson number limit for stable conditions ISBA-SNOW3L turbulent exchange option
  - 'M98': Martin et Lejeune 1998: older computation for turbulent fluxes coefficents in Crocus
- CCPSURF: type of specific heat at surface. The following options are currently available:
  - 'DRY': specific heat does not depend on humidity at surface
  - 'HUM': specific heat depends on humidity at surface.
- XTSTEP: time step for ISBA. Default is to use the time-step given by the atmospheric coupling (seconds).
- XCVHEATF: Modify Cv to compensate biases in ground temperature
- XCGMAX: maximum value for soil heat capacity.
- XCDRAG: drag coefficient in canopy.
- LGLACIER: If activated, specific treatment (as in Arpege) over permanent snow/ice regions. Snow depth initialised to 10m and soil ice to porosity. During the run, snow albedo ranges from 0.8 to 0.85
- LCANOPY_DRAG: drag activated in SBL scheme within the canopy
- LVEGUPD: True = update vegetation parameters every decade
- LPERTSURF: if T modification of surface fluxes for ensemble forecasting

6.4.3 NAM_SURF_DUST

Name	Type	Values	Default	X-Reference
CEMISPARAM_DST	character(LEN=5)	'AMMA','Dal87','EXPLI', 'alf98','She84',PaG77', 'CRUM'	'AMMA'	
CVERMOD	character(LEN=6)	'CMDVER','NONE'	'NONE'	
XFLX_MSS_FDG_FCT	real		12.0e-4	

- CEMISPARAM_DST: One-line dust emission parameterization type. This namelist gives the distribution of emitted dust of SURFEX. For Each paramterization type, a geometric standard deviation and a median radius is given. Moreover , the repatition of mass flux could be derive from the friction velocity (case of "AMMA" or "EXPLI") or imposed (case of "Dal87", "alf98", "She84" or "PaG77". See the code init_dstn.f90 (MesoNH) or init_dstn.mnh (AROME, ALADIN) for values associated to these parameterizations. Note that if the defaut value is change, it is necessary to uses the same modes in the dust initialisation in the atmospheric model. It concerns the value of XINIRADIUS (initial radius), XINISIG (standard deviation) and CRGUNITD (mean radius definition) to have the same aerosol size distribution emitted and in the atmosphere. It is possible to do it directly in the fortran code (modd_dust.mnh in case of aladin/arome, modd_dust.f90 for MesoNH) or for MesoNH only, change the values of these variables in NAM_AERO_CONF (prep_real_case or prep_ideal_case).
- XFLX_MSS_FDG_FCT: Value of the α factor representing the ratio of the vertical mass flux over the horizontal mass flux in the saltation layer (use only If CVERMOD='NONE'). This α factor depend on the size distribution of the aerosol consider in the model.
- CVERMOD New parameterization of the dust emission formulation. In development, not recommended to uses it in this version.

6.4.4 NAM_AGRI

Name	Type	Values	Default	X-Reference
LAGRIP	logical		F	
LIRRIGMODE	logical		F	
XTHRESHOLD	real(4)	[0-1]	(/0.70,0.55,0.40,0.25/)	
NVEG_IRR	integer	[0-NVEGTYPE]	6	
NPATCH_TREE	integer	[0-NVEGTYPE]	none	
NIRR_STOP_BTR	integer		14 (days)	

- LAGRIP: General switch for agricultural practices (seeding and irrigation)
- LIRRIGMODE: flag to activate irrigation. With LAGRIP and/or LIRRIGMODE, if ECOCLIMAP-SG is activated (LECOSG = T in namelist NAM_FRAC) the vegetation types associated (define with NUNIF_VEG_IRR_USE, see NAM_DATA_ISBA) are duplicated. In this case, NPATCH (from namelist NAM_ISBA) have to be adapted to indicate how many patch are finally considered (with default irrigated vegetation type, is currently 2, 4, 5, 10, 12, 14, 15, 19 or 26). Then, by default you need nothing more without ECOCLIMAP-SG. With ECOCLIMAP-SG it is extremely recommended to use the map provided with ECOCLIMAP-SG forcing (cf CFNAM_IRRIGFRAC and CFTYP_IRRIGFRAC in namelist NAM_DATA_ISBA).
- XTHRESHOLD: if LIRRIGMODE is activated, XTHRESHOLD is the 4 successive stage threshold to trigger the irrigation. It can be overwrite by more specific values in the namelist NAM_DATA_ISBA.
- NVEG_IRR: if LAGRIP or/and LIRRIGMODE are activated, correspond to the number of patch irrigated or/and with agricultural practices. The default value is 6 with ECOCLIMAP-SG and LIRRIGMODE, 0 without ECOCLIMAP-SG. NB if you indicate 0, the default value is used.

- NPATCH_TREE: with ECOCLIMAP-SG and if LAGRIP or/and LIRRIGMODE are activated, correspond to the tree patch distribution without irrigation. By default (if default values of NVEG_IRR and NVEG_IRR_USE are used) it takes automatically a value corresponding to NPATCH, else the value of patch tree without irrigation use has to be indicated (1, 2, 3, 7, 9, 10, 12, 13 or 20).
- NIRR_STOP_BTR: Number of days corresponding to the time when the irrigation stop before reaping.

6.4.5 NAM_DEEPSOIL

Name	Type	Values	Default	X-Reference
LDEEPSOIL	logical		F	
LPHYSDOMC	logical		F	

- LDEEPSOIL: General switch for deep soil fields (temperature and relaxation time).
- LPHYSDOMC: General switch to impose CT and soil water/ice contents CT(:) = 9.427757E-6

6.4.6 NAM_TREEDRAG

Name	Type	Values	Default	X-Reference
LTREEDRAG	logical		F	

- LTREEDRAG: flag used to take into account tree drag in the atmospheric model instead of SURFEX.

6.4.7 NAM_ISBA_CCn

Controls ISBA-CC scheme as published in Delire et al. 2020 (JAMES). Coupling variables that allow to get CO_2 fluxes produced by the oceanic biogeochemistry scheme

Name	Type	Values	Default	X-Reference
LSPINUPCARBS	logical		F	
XSPINMAXS	real		0.	
NNBYEARSPINS	integer		0	
XMISSFCO2	real		0.0	
LFIRE	logical		F	
LCLEACH	logical		F	
LADVECT_SOC	logical		F	
LCRYOTURB	logical		F	
LBIOTURB	logical		F	

- LSPINUPCARBS: if T, to do the soil carbon spinup
- XSPINMAXS :This key defines the spinup time step as the increase of the physical time step by a factor equal to XSPINMAXS. So, if the physical (isba time step) = 300s and XSPINMAXS = 50, then the carbon spinup time step = 15000s.
- NNBYEARSPINS: number of years needed to reach soil equilibrium (spinup time step is at its maximum during 80% of the defined NNBYEARSPINS, then decrease linearly to reach the physical time step). So, if XSPINMAXS = 50 and NNBYEARSPINS =250, the spinup procedure is at maximum during 200 physical years representing 200x50 = 10 000 carbon years.
- XMISSFCO2: Missing carbon flux (cf. anthropic) required for ESM coupling in emission mode (default = 0.)
- LFIRE: flag to activate simple biomass fire module

- LCLEACH: flag to activate soil carbon leaching that produce dissolved organic carbon that can be routed by CTRIP
- LADVECT_SOC: flag to activate vertical advection scheme for soil dynamics carbon module, only if CRESPSL = DIF (in NAM_PREP_ISBA_CARBON)
- LCRYOTURB: flag to activate vertical cryoturbation scheme if CRESPSL = DIF (in NAM_PREP_ISBA_CARBON)
- LBIOTURB: flag to activate vertical bioturbation scheme if CRESPSL = DIF (in NAM_PREP_ISBA_CARBON)

6.4.8 NAM_SURF_SNOW_CSTS

Name	Type	Values	Default	X-Reference
XZ0ICEZ0SNOW	real		10.	
XRHOTHRESHOLD_ICE	real		850.	
XALBICE1	real		0.38	
XALBICE2	real		0.23	
XALBICE3	real		0.08	
XVAGING_NOGLACIER	real		60.	
XVAGING_GLACIER	real		900.	
XPERCENTAGEPORE	real		0.05	
XVVISC3	real		0.023	
X_RI_MAX	real		0.20	
XIMPUR_INIT(1)	real, dimension(5)		4.0e-9	
XIMPUR_INIT(2)	real, dimension(5)		5.0e-6	
XIMPUR_COEFF(1)	real, dimension(5)		5.0e-9	
XIMPUR_COEFF(2)	real, dimension(5)		10.0e-6	
XPSR_SNOWMAK	real		0.0012	
XRHO_SNOWMAK	real		600	
XPTA_SEUIL	real		268	
XPROD_SCHEME	real, dimension(5)		2500, 5000, 4000, 2500, 1000	
XSM_END	real, dimension(4)		4, 15, 4, 15	
XFREQ_GRO	integer		1	

- XZ0ICEZ0SNOW: roughness length ratio between ice and snow
- XRHOTHRESHOLD_ICE: density threshold for ice detection in CROCUS scheme (kg.m^{-3})
- XALBICE1, XALBICE2, XALBICE3: prescribed ice albedo in 3 spectral bands for glacier simulation with CROCUS scheme
- XVAGING_NOGLACIER, XVAGING_GLACIER: for ageing effects
- XPERCENTAGEPORE: percentage of the total pore volume to compute the max liquid water holding capacity
- XVVISC3: density adjustement in the exponential correction for viscosity (in m^3.kg^{-1})
- XIMPUR_INIT(1): initial amount (in g/g) of black carbon present in the falling snow (wet deposition), activated in case of rain or snow.
- XIMPUR_INIT(2): initial amount (in g/g) of dust present in the falling snow (wet deposition), activated in case of rain or snow.
- XIMPUR_COEFF(1): dry deposition coefficient of black carbon over snow surface
- XIMPUR_COEFF(2): dry deposition coefficient of dust over snow surface
- XPSR_SNOWMAK: Machine-made snow precipitation rate (in kg/m^2/s)

- XRHO_SNOWMAK: Machine-made snow density (kg/m^3)
- XPTA_SEUIL: Wet but temperature threshold for machine-made snow production (K)
- XPROD_SCHEME: Snow production by machines in Crocus-RESORT. When LSELF_PROD=F, the production is forced to match to production scheme defined by XPROD_SCHEME. For Nov, Dec, Jan, Feb and Mar, every day at 18:00, a production counter is compared to the target. If it's lower, the production is allowed.
- XSM_END: Month and day to stop grooming in Crocus-RESORT. (for LSNOWMAK_BOOL = F and for LSNOWMAK_BOOL = T, respectively)
- XFREQ_GRO: Grooming frequency (usually 1/day)

6.4.9 NAM_ISBA_SNOWn

Name	Type	Values	Default	X-Reference
CSNOWDRIFT	character(LEN=4)	'NONE' ,'DFLT','VI13','GA01'	'DFLT'	
LSNOWDRIFT_SUBLIM	logical		F	
LSNOW_ABS_ZENITH	logical		F	
CSNOWMETAMO	character(LEN=3)	'B92', 'C13', 'T07', 'F06','S-C','S-F'	'B92'	
CSNOWRAD	character(LEN=3)	'B92', 'T17'	'B92'	
LATMORAD	logical		F	
LSNOWSYTRON	logical		F	
CSNOWFALL	character(LEN=3)	'V12','S14','A76','NZE'	'V12'	
CSNOWCOND	character(LEN=3)	'Y81','I02'	'Y81'	
CSNOWHOLD	character(LEN=3)	'B92','SPK','B02'	'B92'	
CSNOWCOMP	character(LEN=3)	'B92','T11','S14'	'B92'	
CSNOWZREF	character(LEN=3)	'CST','VAR'	'CST'	
LSNOWCOMPACT_BOOL	logical		F	
LSNOWMAK_BOOL	logical		F	
LSNOWMAK_PROP	logical		F	
LSNOWTILLER	logical		F	
LSELF_PROD	logical		F	

- CSNOWDRIFT: key to activate the snowdrift scheme, with 4 possible values
  - NONE: snowdrift scheme disactivated (equivalent to LSNOWDRIFT=F in SURFEX V8.1)
  - DFLT: Default snowdrift scheme activated, properties of falling snow are purely dendritic (equivalent to LSNOWDRIFT = T in SURFEX V8.1)
  - VI13: Properties of falling snow are taken from Vionnet et al. (2013)
  - GA01: Properties of falling snow are taken from Gallée et al. (2001)
- LSNOWDRIFT_SUBLIM: logical for snowdrift subliation
- LSNOW_ABS_ZENITH: if T modify solar absorption as a function of solar zenithal angle (physically wrong but better results in polar regions when CSNOWRAD=B92)
- CSNOWMETAMO: Scheme of snow metamorphism (Crocus)
  - B92: obsolete option which will be removed in a next version. Historical version, Brun et al. 1992
  - C13: Translation of B92 option in terms of Optical Diameter and spericity (Carmagnola et al 2014)
  - T07: Experimental evolution law of optical diameter from Taillandier et al 2007
  - F06: Evolution law of the optical diameter from Flanner et al 2006, which fitst the model outputs of a snow microstructure model representing the diffusive vapour fluxes among the grains.

  - S-C: Experimental evolution law of Optical Diameter from Schleef et al, 2014 for the first 48 hours after snowfall, then C13 option.
  - S-F: Experimental evolution law of Optical Diameter from Schleef et al, 2014 for the first 48 hours after snowfall, then F06 option.

- CSNOWRAD: radiative transfer scheme in snow (Crocus)
  - B92: historical version, Brun et al. 1992 with empirical parameterization of ageing in the visible band (default)
  - T17: 2 flow spectral scheme TARTES (Libois et al, 2013) with explicit impact of SSA, impurities, and zenithal angle on spectral reflectances. Increase computing time by a factor of 10. Require a careful setting of impurities deposition.

- LATMORAD: key to activate atmotartes scheme

- LSNOWSYTRON: to activate the blowing snow module SYTRON (Vionnet et al. 2018) which simulates erosion and accumulation between opposite slope aspects in the topographic-based geometry used by MF operational simulations for avalanche hazard forecasting. This option must be maintained to FALSE in all other simulation geometries. It is recommended to combine LSNOWSYTRON=T with CSNOWDRIFT=VI13 (better skill scores in terms of blowing snow occurrence)

- CSNOWFALL: parametrization of falling snow compaction
  - V12: function of air temperature and wind speed following Vionnet et al 2012 from experiments of Pahaut at Col de Porte (default)
  - S14: function of air temperature and wind speed following Schmucki et al 2014, law used in the swiss SNOWPACK model
  - A76: function of air temperature from Anderson, 1976 (law used in ISBA-ES)
  - NZE: constant at 200 kg/m^3 for maritime climates (New Zealand)

- CSNOWCOND: parameterization of snow thermal conductivity from snow density
  - Y81: Yen et al 1981 (Default) from experimental values
  - I02: rom ISBA-ES (Boone, 2002; Sun et al., 1999) The law depends not only on density but also on snow temperature and it has a higher conductivity than experimental values to indirectly compensate for the fact that latent heat fluxes due to vapour fluxes are not represented in the model. This is expected to increase vertical heat transfer as temperature increases.

- CSNOWHOLD: parameterization of maximum liquid water holding capacity in the bucket parameterization
  - B92: fixed maximal percentage of the pores' volumes from Pahaut 1975
  - SPK: parameterization of the swiss SNOWPACK model (Wever et al 2014) fitting the experiments of Coléou and Lesaffre (1998)
  - B02: maximal liquid water mass fraction. This parameterization has an opposite behaviour: the higher the density, the higher the maximal volumetric liquid water content.

- CSNOWCOMP: parameterization of snow compaction
  - B92: visco-elastic model using a viscosity function of density and air temperature from Brun et al, 1992 (default)
  - T11: visco-elastic model using a viscosity function of density and air temperature from Teufelsbauer (2011) fitting the data of separate experimental works

  - S14: non-linear relationship between settlement, stress and SSA decrease due to metamorphism from Schleef et al. (2014) for the first 48 h after snowfall. Then, B92 option.

- CSNOWZREF: Reference heights for temperature and wind can be modified depending on snow depth when CSNOWZREF==’VAR’
  - CST: constant reference
  - VAR: variable reference height from the snow surface (i.e. constant from the ground, snow depth has to be removed from reference height)

- LSNOWCOMPACT_BOOL : Activate grooming if T. By default, grooming only applies if SWE > 20 kg/m^2 and between 20h and 21h (and also 6h-9h if there is some snowfall during the night)

- LSNOWMAK_BOOL : Activate snowmaking By default, snowmaking only applies if the wind speed is < 10 km/h, during all the day during the period 01/11-15/12 and between 18h-8h during the period 15/12-31/03. During the first period (base-layer generation), the production is allowed until reaching a water consumption of 150 kg/m^2, according to an average water availability of $= 1500$ m^3/ha. During the second period (snowpack reinforcement), the production is allowed if the total (natural+machine-made) snow height is < 60 cm. Finally, a loss of 30% in the snow production process is applied in every condition.

- LSNOWMAK_PROP: Activate machine made snow physical properties. The machine-made snow properties are set as follows: SSA = 23 m^2/kg, Sphericity = 0.9.

- LSNOWTILLER : Switch for the activation of the tiller effect, which applies down to 35 kg/m^2 below the surface (F = no tiller effect, only compaction).

- LSELF_PROD: Activate the control of snow production. If T, the production follows the predefined rules defined above (threshold of 150 kg/m^2 during the base-layer generation period, threshold of 60 cm during the snowpack reinforcement period).If F, the production is forced to match the pre-set production scheme defined by XPROD_SCHEME.

6.4.10 NAM_ISBA_AGSn

Name	Type	Values	Default	X-Reference
LNITRO_DILU	logical		F	
LDOWNREGU	logical		F	
XCNLIM	real		-0.048	

- LNITRO_DILU: to activate/desactivate nitrogen dilution fct of CO_2 (Calvet et al. 2008).

- LDOWNREGU: downregulation parameterization of CO_2 assimilation for CPHOTO=NCB option. Change in light-use efficiency for carbon assimilation with elevated CO_2 concentration.

- XCNLIM: carbon nitrogen limitation parameter used in both the LNITRO_DILU and the LDOWNREGU options

6.4.11 NAM_ISBA_NUDGINGn

Controls ISBA snow and soil moisture nudging

Name	Type	Values	Default	X-Reference
LNUDG_SWE	logical		F	
LNUDG_SWE_MASK	logical		F	
XTRELAX_SWE	real		86400.	
CNUDG_WG	character(LEN=3)	’DEF’,’DAY’,’MTH’	’DEF’	
LNUDG_WG_MASK	logical		F	
XTRELAX_WG	real		86400.	
XNUDG_Z_WG	real		1.0	

- LNUDG_SWE: flag to activate the snow's nudging
- LNUDG_SWE_MASK: flag to restric the snow nudging to a given region, that is the nudging can be only regional
- XTRELAX_SWE: relaxation time for the snow's nudging (in s)
- CNUDG_WG: key to activate the soil water's nudging
  - 'DEF' : no nudging (Default)
  - 'DAY': daily nudging
  - 'MTH': monthly nudging
- LNUDG_WG_MASK: flag to restric the soil water's nudging to a given region, that is the nudging can be only regional
- XTRELAX_WG: relaxation time for the soil water's nudging (in s)
- XNUDG_Z_WG: vertical profile for the soil water's nudging (Default = 1.0 for each soil layers).

6.5 "TEB" parameterization options

Urban tile.

6.5.1 NAM_TEBn

Name	Type	Values	Default	X-Reference
CZ0H	character(LEN=6)	'MASC95','BRUT82','KAND07'	'KAND07'	
CCH_BEM	character(LEN=5)	','DOE-2'	'DOE-2'	
CURB_LM	character(LEN=4)	'SM10', 'LMEZ'	'LMEZ'	
CZ0EFF_GD	character(LEN=4)	'LR21', 'NONE'	' '	

- CZ0H: TEB option for z0h roof and road:
  - 'MASC95': Mascart et al 1995
  - 'BRUT82': Brustaert 1982
  - 'KAND07': Kanda 2007
- CCH_BEM: BEM option for roof / wall outside convective coefficient :
  - 'DOE-2': DOE-2 model from EnergyPlus Engineering reference, p65
- CURB_LM: option to compute urban mixing length
  - 'SM10': Urban mixing lenght is calculated following Santiago and Martili (2010).
  - 'LMEZ': Urban mixing lenght is equaal to height above ground. Default is LMEZ.
- CZ0EFF_GD: TEB option for effective roughness length for low urban vegetation
  - 'LR21': Lemonsu, Redon et al 2021
  - 'NONE': only vegetation roughness length is used, not taking into account the environment

6.5.2 NAM_TEB_PANELn

Name	Type	Values	Default	X-Reference
CSOLAR_PANEL	character(LEN=3)	'PV','MIX'	'PV'	

- CSOLAR_PANEL: solar panel option
  - 'PV': Only photovoltaic solar panel, generate electricity
  - 'MIX': Mix photovoltaic and thermal solar panel, produce hot water (only works with BEM)

6.5.3 NAM_SPARTACUS

Namelist with parameters for SPARTACUS-Surface when activated in TEB (LSPARTACUS=T in NAM_TEB)

Name	Type	Values	Default	X-Reference
LDO_SW	logical		T	
LDO_LW	logical		T	
LUSE_SW_DIRECT_ALBEDO	logical		F	
LDO_VEGETATION	logical		T	
LDO_URBAN	logical		T	
N_VEGETATION_REGION_URBAN	real	1,2	1	
N_VEGETATION_REGION_FOREST	real	1,2	1	
NSW	real		1	
NLW	real		1	
N_STREAM_SW_URBAN	real		4	
N_STREAM_SW_FOREST	real		4	
N_STREAM_LW_URBAN	real		4	
N_STREAM_LW_FOREST	real		4	
LUSE_SYMMETRIC_VEGETATION_SCALE_URBAN	logical		F	
LUSE_SYMMETRIC_VEGETATION_SCALE_FOREST	logical		F	
XVEGETATION_ISOLATION_FACTOR_URBAN	real	[0.0,1.0]	0.0	
XVEGETATION_ISOLATION_FACTOR_FOREST	real	[0.0,1.0]	0.0	
XMIN_VEGETATION_FRACTION	real		1.0E-6	
XMIN_BUILDING_FRACTION	real		1.0E-6	

- LDO_LW : if T, compute longwave fluxes
- LUSE_SW_DIRECT_ALBEDO : if T, specify groud and roof albedos separately for direct solar radiation
- LDO_VEGETATION : if T, vegetation will be represented
- LDO_URBAN : if T, urban areas will be represented
- N_VEGETATION_REGION_URBAN : Number of regions used to describe urban vegetation (2 needed for heterogeneity)
- N_VEGETATION_REGION_FOREST : Number of regions used to describe forests (2 needed for heterogeneity)
- NSW : Number of spectral bands for solar radiation
- NLW : Number of spectral bands for infrared radiation
- N_STREAM_SW_URBAN : Number of streams per hemisphere to describe shortwave radiation, urban areas
- N_STREAM_LW_URBAN : Number of streams per hemisphere to describe longwave radiation, urban areas
- N_STREAM_SW_FOREST : Number of streams per hemisphere to describe diffuse shortwave radiation, forests
- N_STREAM_LW_FOREST : Number of streams per hemisphere to describe longwave radiation, forests
- LUSE_SYMMETRIC_VEGETATION_SCALE_URBAN : If T tree crowns touch each other ; Eq. 2018 Hogan et al. (2018). If F tree crowns separate (shyness) ; Eq. 19 of Hogan et al. (2018).
- LUSE_SYMMETRIC_VEGETATION_SCALE_FOREST : If T tree crowns touch each other ; Eq. 2018 Hogan et al. (2018).If F tree crowns separate (shyness) ; Eq. 19 of Hogan et al. (2018).

- XVEGETATION_ISOLATION_FACTOR_URBAN : 0.0 = Dense vegetation region is embedded with in sparse region. 1.0 = Dense vegetation is in physically isolated regions
- XVEGETATION_ISOLATION_FACTOR_FOREST : 0.0 = Dense vegetation region is embedded with in sparse region. 1.0 = Dense vegetation is in physically isolated regions
- XMIN_VEGETATION_FRACTION : Minimum area fraction below which a vegetation region is removed completely.
- XMIN_BUILDING_FRACTION : Minimum area fraction below which a building region is removed completely.

6.6 "IDEAL" parameterization options

6.6.1 NAM_IDEAL_FLUX

Name	Type	Values	Default	X-Reference
NFORCF	integer ≤48		2	
NFORCT	integer ≤48		2	
XTIMEF	real(NFORCF)		0	
XTIMET	real(NFORCT)		0	
XSFTH	real(NFORCF)		0.	
CSFTQ	character(LEN=7)	'kg/m2/s', 'W/m2 '	'kg/m2/s'	
XSFTQ	real(NFORCF)		0.	
XSFCO2	real(NFORCF)			
CUSTARTYPE	character(LEN=5)	'Z0 ', 'USTAR'	'Z0 '	
XUSTAR	real(NFORCF)		0.	
XZ0	real		0.01	
XALB	real			
XEMIS	real		1.	
XTSRAD	real(NFORCT)		XTT=273.15K	

- NFORCF: number of surface forcing instants for fluxes since the beginning of the run. The default value is NFORC=2.
- NFORCT: number of surface forcing instants for radiative temperature since the beginning of the run. The default value is NFORC=2.
- XTIMEF: times of forcing for fluxes (from beginning of run)
- XTIMET: times of forcing for temperature (from beginning of run)
- XSFTH: hourly data of heat surface flux (W/m2)
- CSFTQ: Unit for the evaporation flux (kg/m2/s) or (W/m2)
- XSFTQ: hourly data of water vapor surface flux
- XSFCO2: hourly data of CO2 surface flux (kgC02/kg air * m/s)
- CUSTARTYPE: type of computation for friction
- XUSTAR: hourly data of friction (m2/s2)
- XZ0: roughness length (m)
- XALB: albedo (-)
- XEMIS:emissivity (-)
- XTSRAD: radiative temperature (K)

6.7 Coupling to CTRIP model

From V8 SURFEX, namelists for TRIP are moved from OPTIONS.nam to a new separated namelist file, TRIP_OPTIONS.nam.

CTRIP is now entirely independent of SURFEX and coupled with it through OASIS.

More details about this coupling with OASIS are available in the following document: Description for the coupling of SURFEX with OASIS.

6.7.1 NAM_TRIP_GRID

Name	Type	Values	Default	X-Reference
TLONMIN	real		0.	
TLONMAX	real		0.	
TLATMIN	real		0.	
TLATMAX	real		0.	
TRES	real	1.,0.5	0.	

- TLONMIN: minimum longitude (degrees)
- TLONMAX: maximum longitude (degrees)
- TLATMIN: minimum latitude (degrees)
- TLATMAX: maximum latitude (degrees)
- TRES: resolution

6.7.2 NAM_TRIP

Name	Type	Values	Default	X-Reference
CVIT	character(LEN=3)	'DEF','VAR'	'DEF'	
CGROUNDW	character(LEN=3)	'DEF','CST','VAR'	'DEF'	
LGWSUBF	logical		T	
XGWSUBD	real		0.0	
LFLOOD	logical		F	
XCVEL	real		0.5	
XRATMED	real		1.4	
XTSTEP	real		3600.	

- CVIT: type of stream flow velocity:
  - 'DEF': constant velocity = 0.5m/s
  - 'VAR': variable velocity
- CGROUNDW :use groundwater scheme
  - 'DEF': no groundwater scheme
  - 'CST': constant transfert time
  - 'DIF': groundwater diffusive scheme
- LGWSUBF: Use sub-grid fraction to couple with SURFEX, as in Verges et al., JGR, 2014
- XGWSUBD: Sub-grid depth uses to adjust the WTD used to compute the sub-grid fraction
- LFLOOD: to use TRIP-FLOOD
- XCVEL: constant velocity value
- XRATMED: meandering ratio
- XTSTEP: timestep for trip

6.7.3 NAM_TRIP_LAND_CPL

Name	Type	Values	Default	X-Reference
XTSTEP_CPL_LAND	real		-1.0	
CRUNOFF	character(LEN=8)		' '	
CDRAIN	character(LEN=8)		' '	
CFFLOOD	character(LEN=8)		' '	
CPIFLOOD	character(LEN=8)		' '	
CWTD	character(LEN=8)		' '	
CFWTD	character(LEN=8)		' '	
CCALVING	character(LEN=8)		' '	
CSRCFLOOD	character(LEN=8)		' '	

- XTSTEP_CPL_LAND: Coupling time step
- CRUNOFF: Surface runoff
- CDRAIN: Deep drainage
- CFFLOOD: Floodplains fraction
- CPIFLOOD: Flood potential infiltartion
- CWTD: Water table depth
- CFWTD: Grid-cell fraction of WTD to rise
- CCALVING: Calving flux
- CSRCFLOOD: Floodplains freshwater flux

6.7.4 NAM_TRIP_SEA_CPL

Name	Type	Values	Default	X-Reference
XTSTEP_CPL_SEA	real		-1.0	
CRIVDIS	character(LEN=8)		' '	
CCALVGRE	character(LEN=8)		' '	
CCALVANT	character(LEN=8)		' '	

- XTSTEP_CPL_SEA: Coupling time step
- CRIVDIS: River discharges to ocean
- CCALVGRE: Calving flux over greenland
- CCALVANT: Calving flux over antarctica

6.7.5 NAM_TRIP_RUN

Name	Type	Values	Default	X-Reference
CREADFRC	character(LEN=6)	' VECTOR', 'LATLON'	' VECTOR'	
CDRAIN	character(LEN=8)		' DRAIN'	
CRUNOFF	character(LEN=8)		' RUNOFF'	
LCUMFRC	LOGICAL		F	
LDIAG_MISC	LOGICAL		F	
LPRINT	LOGICAL		F	
LRESTART	LOGICAL		T	
XTSTEP_RUN	REAL		86400.	
XTSTEP_DIAG	REAL		86400.	
LWR_DIAG	LOGICAL		T	

- CREADFRC: Forcing file format

  - VECTOR: vector (normaly ilat*ilon)
  - LATLON: Regular lat lon grid
- CDRAIN: Drainage name in FORCING.nc file
- CRUNOFF: Surface runoff name in FORCING.nc file
- LCUMFRC: Cumulated (or not) forcing variables
- LDIAG_MISC: if T, more diag for model testing
- LPRINT: write some information in an ascii file
- LRESTART: write restart file
- XTSTEP_RUN: time step of the forcing file
- XTSTEP_DIAG: time step of the output time series
- LWR_DIAG: to write diag file

6.7.6 NAM_OASIS

Name	Type	Values	Default	X-Reference
LOASIS	logical		F	
CMODEL_NAME	character(LEN=6)		' trip'	

- LOASIS: key to use OASIS
- CMODEL_NAME: component model name

6.7.7 NAM_START_DATE

Name	Type	Values	Default	X-Reference
NYEAR	integer		none	
NMONTH	integer		none	
NDAY	integer		none	
XTIME	real		none	

- NYEAR: current year (UTC)
- NMONTH: current month (UTC)
- NDAY: current day (UTC)
- XTIME: current time (s)

6.7.8 NAM_TRIP_PREP

Name	Type	Values	Default	X-Reference
XTAUG_UNIF	real		30.0	
XTAUG_UP	real		5.0	
XTAUG_DOWN	real		30.0	
LGWEQ	logical		F	
LREAD_FLOOD	logical		F	

- XTAUG_UNIF: Constant transfert time value (for CGROUNDW='CST' in NAM_TRIP)
- XTAUG_UP: Upstream transfert time value (for Groundwater diffusive scheme)
- XTAUG_DOWN: Downstream transfert time value (for Groundwater diffusive scheme)
- LGWEQ: Comput equilibrium water table depth
- LREAD_FLOOD: Read restart flood

6.8 Coupling to TOPMODEL model

6.8.1 NAM_PGD_TOPD

Name	Type	Values	Default	X-Reference
CCAT	character(LEN=15), dimension(15)		”	
LCOUPL_TOPD	logical		F	
XF_PARAM_BV	real		2.5	
XC_DEPTH_RATIO_BV	real		1.	
LDUMMY_SUBCAT	logical		F	
LSUBCAT	logical		F	
NSUBCAT	integer		0	
XLX	real		0	
XLY	real		0	
CFILE_SUBCAT	character(LEN=15), dimension(15)		”	
CSUBCAT	character(LEN=15), dimension(15,15)		”	
LWRITE_SEVERITY_MAPS	logical		F	

- CCAT: base name for topographic files
- LCOUPL_TOPD: to perform the coupling with TOPMODEL
- XF_PARAM_BV: F parameter for the exponential profile, values for each catchment
- XC_DEPTH_RATIO_BV: depth ratio for the exponential profile, values for each catchment
- LDUMMY_SUBCAT : if T, sub-catchements are defined by the user.
- LSUBCAT : If T, sub-catchments are defined (if LDUMMY_SUBCAT=F, they are defined automaticaly)
- NSUBCAT : Only if LDUMMY_SUBCAT=T, number of sub-catchments for the main catchment bv.
- XLX: Only if LDUMMY_SUBCAT=T, X-coordinate (lambx for instance) of the outlet of the sub-catchement sbv of the main catchment bv. sbv is between 1 and NSUBCAT(bv)
- XLY: Only if LDUMMY_SUBCAT=T, Y-coordinate (lamby for instance) of the outlet of the sub-catchement sbv of the main catchment bv. sbv is between 1 and NSUBCAT(bv)
- CFILE_SUBCAT : File with information about the sub-catchments of the main catchment bv.
- CSUBCAT : Name of the sub-catchments sbv of the main catchment bv.
- LWRITE_SEVERITY_MAPS : If T, to produce some "severity maps"

6.8.2 NAM_TOPD

Name	Type	Values	Default	X-Reference
LBUDGET_TOPD	logical		F	
LSTOCK_TOPD	logical		F	
NNB_TOPD	integer		1	
NFREQ_MAPS_WG	integer		0	
NFREQ_MAPS_ASAT	integer		0	
NFREQ_MAPS_RUNOFF	integer		0	
NNB_STP_STOCK	integer		1	
NNB_STEP_RESTART	integer		1	
XSPEEDR	real		1.	
XSPEEDG	real		0.1	
XSPEEDH	real		0.1	
LSPEED_VAR	logical		F	
XQINIT	real		0.	
XRTOP_D2	real		1.	
LPERT_PARAM	logical		F	
LPERT_INIT	logical		F	

- LBUDGET_TOPD: to compute budget
- LSTOCK_TOPD: to stock runoff and drainage values (for another simulation)
- NNB_TOPD: ratio beween time steps of Topmodel and ISBA
- NFREQ_MAPS_WG: frequency of ouput WG maps
- NFREQ_MAPS_ASAT: frequency of output ASAT maps
- NFREQ_MAPS_RUNOFF: Frequency of writting saturated areas in files at specific format (.map)
- NNB_STP_STOCK: number of time steps to write for the next simulation
- NNB_STP_RESTART: number of time steps to restart from a previous simulation
- XSPEEDR: river speed
- XSPEEDG: ground speed
- XSPEEDH: Speed of water in the river for the catchment bv
- LSPEED_VAR : if T, the speed of water in the river is defined following the discharge value (see Artinyan et al., 2016.)
- XQINIT: initial discharge at the outlet of the catchments
- XRTOP_D2: depth used by topodyn for lateral transfers (expressed in ratio of isba d2)
- LPERT_PARAM : if T, the hydrodynamical parameters will be perturbed following the method of Edouard et al. 2016.
- LPERT_INIT: If T, the initial conditions will be perturbed following the method of Edouard et al. 2016.

7 Running the chemical schemes

Here are described the options available during the run of the several schemes for emission and deposition of chemical species. Note that all the schemes for deposition and emission of chemical species do activate only if chemical species are present (i.e. if the coupling between atmosphere and surface include the chemical species concentrations and fluxes).

7.1 NAM_CH_CONTROLn

Chemical settings control.

Name	Type	Values	Default	X-Reference
CCHEM_SURF_FILE	character(LEN=28)		' '	

- CCHEM_SURF_FILE: name of general chemical ASCII input file.

Whatever the choice for the type of calculation of the emissions (either by mapping of emissions at different times CCH_EMIS='AGGR' or computation by SNAPs, CCH_EMIS='SNAP'), the user needs to define :

- how to do the translation: from the emitted chemical species that are in the inventory to the chemical species that are emitted to the atmospheric chemical scheme (that of course are usually not the same)
- the information for the deposition scheme basic information on the chemical species (example: molar mass)

This translation is done in an ASCII file that contains a lot of information on the chemical schemes. This file should be done by an expert in air chemistry, that also has knowledge on the inventories.

Here is an example of this file, for only two chemical species (CO_2 and CO) :

```
============================================================
*** the following section will be used by ch_init_emissionn.f90 ***
============================================================

EMISDATA
emission fluxes (in nMole/m2/day) from SHIP data DMS(flux) = 1.7 nmol/m2/d
MOL
1 species
1 records
DMS
(F10.0,/,99(5E10.2))
0.
1.7

============================================================
*** the following section will be used by ch_init_emissionn.F90 and ch_init_snapn.F90 ***
============================================================

EMISUNIT
Emission Stut. Univ. EUROPE 10KM
MIX
```

```
AGREGATION
Schema reduit ReLACS
CO2 1.0 CO2
END_AGREGATION

=====================================================================
*** the following section will be read by ch_init_dep_isban.F90 ***
=====================================================================

SURF_RES
surface resistances (s/m), refer to Seinfeld and Pandis, 1998, p. 975, Tab.19.2
1
(1X,A12,1X,F7.1)
'NONE ' 2500.1

=====================================================================
*** the following section will be read by ch_init_depconst.F90 ***
=====================================================================

MASS_MOL
molecular mass (in g/mol) for molecular diffusion, from Stockwell et al., 1997
2
(1X,A12,1X,F11.3)
'CO2 ' 44.000
'CO ' 28.000

REA_FACT
reactivity factor with biology, Seinfeld and Pandis, 1998, p. 975, Tab. 19.3
2
(1X,A12,1X,F4.1)
'CO2 ' 0.0
'CO ' 0.0

HENRY_SP
Henry specific constant, CO2 according to Seinfeld p347
2
(1X,A12,1X,E18.2,1X,F8.0)
'CO2 ' 3.40E-2 ' 0.
'CO ' 9.50E-4 ' -1300.
```

7.2 NAM_CH_SURFn

Chemical anthropogenic emissions.

Name	Type	Values	Default	X-Reference
LCH_SURF_EMIS	logical		F	

- LCH_SURF_EMIS: flag to use anthropogenic emissions or not.

7.3 NAM_CH_SEAFLUXn

Chemical deposition over sea/ocean.

Name	Type	Values	Default	X-Reference
CCH_DRY_DEP	character(LEN=6)	'NONE','WES89'	'WES89'	

- CCH_DRY_DEP: type of deposition scheme.

- 'NONE ': no chemical deposition scheme.
- 'WES89 ': Wesley (1989) deposition scheme.

7.4 NAM_CH_WATFLUXn

Chemical deposition over inland water.

Name	Type	Values	Default	X-Reference
CCH_DRY_DEP	character(LEN=6)	'NONE','WES89'	'WES89'	

- CCH_DRY_DEP: type of deposition scheme.
  - 'NONE ': no chemical deposition scheme.
  - 'WES89 ': Wesley (1989) deposition scheme.

7.5 NAM_CH_TEBn

Chemical deposition over towns.

Name	Type	Values	Default	X-Reference
CCH_DRY_DEP	character(LEN=6)	'NONE','WES89'	'WES89'	

- CCH_DRY_DEP: type of deposition scheme.
  - 'NONE ': no chemical deposition scheme.
  - 'WES89 ': Wesley (1989) deposition scheme.

7.6 NAM_CH_ISBAn

Chemical deposition and biogenic emissions over vegetation.

Name	Type	Values	Default	X-Reference
CCH_DRY_DEP	character(LEN=6)	'NONE','WES89'	'WES89'	
LCH_BIO_FLUX	logical		F	
LCH_NO_FLUX	logical		F	

- CCH_DRY_DEP: type of deposition scheme.
  - 'NONE ': no chemical deposition scheme.
  - 'WES89 ': Wesley (1989) deposition scheme.
- LCH_BIO_FLUX: flag to activate the biogenic emissions.
- LCH_NO_FLUX: flag to activate the NO emissions.

7.7 NAM_CHS_ORILAM

Chemical aerosol scheme ORILAM.

Name	Type	Values	Default	X-Reference
LCH_AERO_FLUX	logical		F	
LCO2PM	logical		F	
XEMISRADIUSI	real		0.036	
XEMISRADIUSJ	real		0.385	
XEMISSIGI	real		1.86	
XEMISSIGJ	real		1.29	
CRGUNIT	character(LEN=4)	"MASS", "NUMB"	"NUMB"	

- LCH_AERO_FLUX: switch to active aerosol surface flux for ORILAM
- LCO2PM: switch to activate emission of primary aerosol (Black and Organic carbon) compute from CO emssion. Uses only if CO emission is defined in the surface field (see PREP_PGD) and if there is no data for primary aerosol emissison.

- XEMISRADIUSI: Aerosol flux, mean radius of aitken mode in μm (only if LCH_AERO_FLUX=T).
- XEMISRADIUSJ: Aerosol flux, mean radius of accumulation mode in μm (only if LCH_AERO_FLUX=T).
- XEMISSIGI: Aerosol flux, standard deviation of aitken mode in μm (only if LCH_AERO_FLUX=T).
- XEMISSIGJ: Aerosol flux, standard deviation of accumulation mode in μm (only if LCH_AERO_FLUX=T).
- CRGUNIT: Aerosol flux, Definition of XEMISRADIUSI or XEMISRADIUSJ: mean radius can be define in mass ("MASS") or in number (NUMB).

8 Surface diagnostics

The diagnostics for the surface require the call to the complete physics of the surface. Therefore, they can be computed either during the run of the schemes (in order to have for example continuous time series of these diagnostics), or can be computed at a given instant only, if atmospheric forcing is given at this instant for the surface scheme to do one time step. The cumulated diagnostics are of course significant only when computed during a run.

8.1 NAM_DIAG_SURF_ATMn

Diagnostics relative to each grid cell.

Name	Type	Values	Default	X-Reference
LFRAC	logical		F	
LDIAG_GRID	logical		F	
LT2MMW	logical		F	
LDIAG_MIP	logical		F	

- LFRAC: flag to save in the output file the sea, inland water, natural covers and town fractions.
- LDIAG_GRID: flag for mean grid diagnostics
- LT2MMW: gAlternative weighting of grid average T2M giving more weight to the land tile.
- LDIAG_MIP: flag to perform intercomparison of land surface model diagnostics as required by several MIP (such as CMIP, SnowMIP, GCP, GSWP, etc.). These diag are only relevant when using XIOS. These diag are only implemented for general surf_atm diags, seaflux, Flake and ISBA. The list of diags is given in the surfex_fields.xml file used by XIOS. Note that when this key is activated, the following namelist are not used: NAM_DIAG_SURF_ATMn, NAM_DIAG_SURFn, NAM_DIAG_ISBAn.

8.2 NAM_DIAG_SURFn

Diagnostics for each grid cell and each tile.

Name	Type	Values	Default	X-Reference
N2M	integer	0, 2	2	
LSURF_BUDGET	logical		F	
LSURF_BUDGETC	logical		F	
LRESET_BUDGETC	logical		F	
LRAD_BUDGET	logical		F	
LCOEF	logical		F	
LSURF_VARS	logical		F	
L2M_MIN_ZS	logical		F	

- N2M: gflag to compute surface boundary layer characteristics:
  - N2M=2: gcomputes temperature at 2 m, specific humidity at 2 m, relative humidity, zonal and meridian wind at 10 m, and Richardson number. 2m and 10m quantities are calculated interpolating between atmospheric forcing variables and surface temperature and humidity.
- LSURF_BUDGET: flag to save in the output file the terms of the surface energy balance (net radiation, sensible heat flux, latent heat flux, ground flux), for each scheme (on the four separate tiles), on each patch of the vegetation scheme if existing, and aggregated for the whole surface. The diagnosed fields are (* stands for the scheme considered (*=nothing: gfield aggregated on the whole surface;*=name of a scheme : field for this scheme):
  - RN_*: gnet radiation
  - H_*: gturbulent sensible heat flux

  - LE_*: gturbulent latent heat flux
  - GFLUX_*: ground or storage heat flux
  - FMU_*: gzonal wind stress
  - FMV_*: gmeridian wind stress
    If both LSURF_BUDGET and LRAD_BUDGET are T then downward and upward short-wave radiation per spectral band will be written into output file (they are computed even if LRAD_BUDGET is False). The following output fields are then available:
  - SWD_*: gdownward short wave radiation
  - SWU_*: upward short wave radiation
  - SWBD_*: gdownward short wave radiation for each spectral band
  - SWBU_*: gupward short wave radiation for each spectral band
  - LWD_*:downward long wave radiation
  - LWU_*: gupward long wave radiation

- LSURF_BUDGETC: flag to save in the output file the time integrated values of all budget terms that have been activated
- LRESET_BUDGETC: flag to reset cumulatives variables at the beginning of a run
- LCOEF: flag to save in the output file the transfer coefficients used in the computation of the surface energy fluxes, for each scheme (on the four separate tiles) and aggregated for the whole surface. The diagnosed fields are (* stands for the scheme considered (*=nothing: gfield aggregated on the whole surface; *=name of a scheme : field for this scheme):
  - CD_*: gdrag coefficient for momentum
  - CH_*: gdrag coefficient for heat
  - CE_*: gdrag coefficient for evaporation (differs from CH only over sea)
  - Z0_*: groughness length
  - Z0H_*: gthermal roughness length
- LSURF_VARS: flag to save in the output file the surface specific humidity for each scheme (on the four separate tiles), on each patch of the vegetation scheme if existing. The diagnosed fields are (* stands for the scheme considered (*=nothing: gfield aggregated on the whole surface; *=name of a scheme :< field for this scheme):
  - QS_*: gspecific humidity
- L2M_MIN_ZS: flag for 2 meters quantities evaluated on the minimum orographyy of the grid

8.3 NAM_WRITE_DIAG_SURFn

Diagnostics for to each grid cell and each tile.

Name	Type	Values	Default	X-Reference
LSELECT	logical		F	
CSELECT	array of string of characters			
LPROVAR_TO_DIAG	logical		F	
LSNOWDIMNC	logical		F	
LRESETCUMUL	logical		F	

- LSELECT: if T it indicates that a selection will be used as output .
- CSELECT: array containing the list of output fields .
- LPROVAR_TO_DIAG: used to write out prognostic variables like diagnostic one, on average over all patches.

- LSNOWDIMNC: gin case of OFFLIN output files, to write the output snow fields in 2D (number of points / number of snow layers).
- LRESETCUMUL: gin OFFLINE mode, for the ISBA scheme, replaces the instantaneous fields by the averaged cumulated fields on the output writing time step. Then the cumulated fields are cumulated during the writing time steps and reset at the end of each of them.

8.4 NAM_DIAG_ISBAn

ISBA diagnostics.

Name	Type	Values	Default	X-Reference
LPGD	logical		F	
LSURF_EVAP_BUDGET	logical		F	
LSURF_MISC_BUDGET	logical		F	
LSURF_DIAG_ALBEDO	logical		F	
LPATCH_BUDGET	logical		T	
LSURF_MISC_DIF	logical		F	
LWATER_BUDGET	logical		F	
LLUTILES_BUDGET	logical		F	
LPROSNOW	logical		F	
LPROBANDS	logical		F	
LVOLUMETRIC_SNOWLIQ	logical		F	
LUTCI	logical		F	

- LPGD: gflag to save in the output file the physiographic fields of ISBA scheme that are computed from ecoclimap data from the ecosystem fractions.
- LSURF_EVAP_BUDGET: flag to save in the output file the detailed terms of the water vapor fluxes, on each patch of the vegetation scheme if existing, and aggregated for the natural surface. The diagnosed fields are:
  - GPP: gGross primary production
- LSURF_MISC_BUDGET: flag to save in the output file miscelleaneous fields. The diagnosed fields are:
  - HV: gHalstead coefficient
  - SNG: gsnow fraction over bare ground
  - SNV: gsnow fraction over vegetation
  - SN: gtotal snow fraction
  - SWI: gsoil wetness index for each ground layer (wg - wwilt)/(wfc - wwilt) where wg is the volumic water content, wfc is the porosity and wwilt corresponds to the plant wilting point.
- LSURF_DIAG_ALBEDO: to write ALB..._ISBA et ALB..._S.
- LPATCH_BUDGET: flag to save in the output file the diagnostics for each patch (default is .T.)
- LSURF_MISC_DIF: to calculate and write specific DIF diagnostics
- LWATER_BUDGET: gto calculate and write the water budget
- LLUTILES_BUDGET: flag to bring together diag from the ISBA patches into 4 surface covers type required for land-use-land-cover purpose (not implemented for ECOCLIMAP-SG)
  1. Primary and secondary natural land (Forest, grassland, bare ground, etc.)
  2. Cropland (Agriculture)
  3. Pastureland (not yet implemented in ISBA)
  4. Urban settlement (not yet implemented; should be implemented if TEB is used).

- LPROSNOW:: gadds new diagnostic fields for the CROCUS snow scheme, reproject the snow mantel and other diagnostic fields on the vertical, according to the subgrid slope, and merges ISBA_PROGNOSTIC.OUT.nc and ISBA_DIAGNOSTICS.OUT.nc in ISBA_PROGNOSTIC.OUT.nc, in case of CTIMESERIES_FILETYPE = "OFFLIN".
- LPROBANDS: gEnable the spectral resolution of Crocus diagnostics, necessary if you want to get spectral albedo and spectral direct/diffuse ratio diagnostics
- LVOLUMETRIC_SNOWLIQ: gconverts the SNOWLIQ diagnostic field in kg / m3 (instead of m).
- LUTCI: gflag to compute UTCI (human thermal comfort indicator) quantities in rural areas.

8.5 NAM_DIAG_TEBn

TEB diagnostics.

Name	Type	Values	Default	X-Reference
LPGD	logical	F		
LSURF_MISC_BUDGET	logical		F	
LSURF_DIAG_ALBEDO	logical		F	
LUTCI	logical		F	

- LPGD: gflag to save PGD fields if TEB garden is activated
- LSURF_MISC_BUDGET: flag to save in the output file miscelleaneous fields. The diagnosed fields are:
  - Z0_TOWN: groughness length for town
  - QF_BLD: gdomestic heating
  - QF_BLDWFR: gdomestic heating
  - FLX_BLD: gheat flux from bld
  - TI_BLD_EQ: ginternal temperature without heating
  - TI_BLDWFR: ginternal temperature without heating
  - QF_TOWN: gtotal anthropogenic heat
  - DQS_TOWN: gstorage inside building
  - H_WALL: gwall sensible heat flux
  - H_ROOF: roof sensible heat flux
  - H_ROAD: road sensible heat flux
  - RN_WALL: gnet radiation at wall
  - RN_ROOF: gnet radiation at roof
  - RN_ROAD: net radiation at road
  - GFLUX_WALL: gnet wall conduction flux
  - GFLUX_ROOF: gnet roof conduction flux
  - GFLUX_ROAD: gnet road conduction flux
  - LE_ROOF: groof latent heat flux
  - LE_ROAD: groad latent heat flux
- LSURF_DIAG_ALBEDO: gflag to save in the output file albedo diagnostics
- LUTCI: gto calculate and write UTCI diagnostics

8.6 NAM_DIAG_FLAKEn

FLake diagnostics.

Name	Type	Values	Default	X-Reference
LWATER_PROFILE	logical		F	
XZWAT_PROFILE	real			

- LWATER_PROFILE: flag to save in the output file miscelleaneous fields. The diagnostic is temperature at the depths defined by:
- XZWAT _PROFILE: gdepth of output levels (m) in namelist

8.7 NAM_DIAG_OCEANn

Sea diagnostics.

Name	Type	Values	Default	X-Reference
LDIAG_OCEAN	logical		F	

- LDIAG_OCEAN: flag for ocean variables

8.8 Sea-Ice schemes diagnostics

Sea-ice diagnostics described and activated in 6.2.4.

9 Data assimilation

This section contains descriptions on data-assimilation methods available in SURFEX.

9.1 Interface and usage

All related assimilation code is found in the source directory ASSIM.

The interface to the data assimilation is through the routine assim_surf_atmn. Input needed to this routine and the downstream call-tree is either given as arguments or via a normal initalization through the routine init_surf_atmn.

The assimilation is tile-independent. That means the individual tiles are treated separately and different assimilation alghoritms can be used for the different tiles. This documentation will explain the different options for the different tiles.

Inside the assimilation interface and below, no IO should be performed unless the IO is processor dependent and in that case the number of processors must be kept constant.

After the assimilation is performed the updated fields are written out through the normal SURFEX output routines (write_surf_atmn).

The assimilation is enabled in by setting LASSIM=T together with the selected schemes and the started in either inline or offline mode.

Relevant settings in namelist NAM_ASSIM:

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
LASSIM	logical		F	
NPRINTLEV	INTEGER		0	

- LASSIM: Enables assimilation
- NPRINTLEV: Verbosity level

9.1.1 Inline (CANARI)

From cy38h1 and cy40t1 it is (should/could) possible to run the assimilation in SURFEX in an inline mode. The interface to assim_surf_atmn is called at the end of CANARI after first initializing SURFEX the same way as for a normal forecast using SURFEX.

The result of the CANARI analysis exists in memory, and are sent as arguments to the routine assim_surf_atmn. The number of sub-domains (blocks) used in SURFEX is depending on the number of CPUs used for CANARI. Inside the assimilation interface and below, no IO should be performed unless the IO is processor dependent and in that case the number of processors must be kept constant. If one or more of you selected schemes read files specified for a certain CPU, the number of CPUs used for CANARI must stay constant. This is now the case for EKF.

After the assimilation is performed the updated fields are written out through the normal SURFEX output routines also used for the forecast using SURFEX (WRSFX which in the end calls write_surf_atmn etc.).

9.1.2 Offline (SODA)

The SURFEX offline data assimilation (SODA) was the first implementation of a unified assimilation in SURFEX.

The binary is called SODA and is a wrapper to do intialization and read the needed input data to be able to call the assimilation interface assim_surf_atm_n.

Namelist settings in NAM_ASSIM used in soda: LAROME and LALADSURF

9.2 Sea tile

All points containing a fraction of sea enter the same call tree in assim_sea_n. In this section the namelist settings and alghoritms will be explained.

9.2.1 Sea properties from data source

At the moment no particular data assimilation is done for the sea-tile and only SST is modified. Depending on the namelist options in NAM_ASSIM the sea properties the SST is taken from the following sources:

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
LAESST	logical		F	
LREAD_SST_FROM_FILE	logical		F	
LEXTRAP_SEA	logical		F	

If LAESST is T the SST in SURFEX is overwritten by the SST entering assim_sea_n as input. If LREAD_SST_FROM_FILE=T, this value is read from file. The typical HIRLAM usage is to read this from the boundary file, which is from ECMWF based on the UK OSTIA product.

if LAESST is F, the SST is set from the SST possibly analysed by CANARI.

9.2.2 Extrapolation of sea temperatures

SURFEX has a sea fraction, but CANARI has a binary land-sea mask. There is an option to set LEXTRAP_SEA=T, to extrapolate the nearest (in space) SST value in point where CANARI has land, but SURFEX has a sea fraction. This is to avoid that the SST gets a too high influence of land temperatures, which can be important in areas with large gradients in land/sea (e.g. fjords).

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
LEXTRAP_SEA	logical		F	

9.3 Inland water tile

All points containing a fraction of inland water enter the same call tree. In this section the namelist settings and alghoritms will be explained.

9.3.1 Use nature temperature over inland water

This is activated by setting LWATERTG2=T If enabled points defined by having both fractions of nature temperature and inland water temperature, the inland water temperature is replaced by the nature temperature in level 2 (deep soil for ISBA Force-restore).

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
LWATERTG2	logical		F	

A typical usage of LWATERTG2=T is to combine it with LEXTRAP_WATER=T to force the inland water temperatures to be replaced by the nearest values of points where nature and inland water are both defined.

9.3.2 Extrapolation of inland water temperatures

By setting LEXTRAP_WATER=T inland water points, which in CANARI are defined as land points, will be filled by the nearest points where the CANARI analysis has water defined.

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
LEXTRAP_SEA	logical		F	

9.4 Nature tile

All points containing a fraction of nature enter the same call tree. In this section the namelist settings and alghoritms will be explained.

9.4.1 ISBA snow update

The main entry point for snow assimilation in ISBA schemes are under ASSIM_ISBA_n, which calls ASSIM_ISBA_UPDATE_SNOW. Update of SURFEX snow is activated by setting LAESNM. However only D95 is supported at the moment. The snow fields updated to are entering the routines as input, and will normally come from the CANARI analysis. It can be notified as OI does a small alteration of the snow water equvivalent, the routine ASSIM_ISBA_UPDATE_SNOW is called twice to get the total increment after updating the snow.

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
LAESNM_SEA	logical		F	

- LAESNM: if T, update of the snow properties are performed.

9.4.2 ISBA: OI soil assimilation

The entry point of the OI soil assimilation is through ASSIM_NATURE_ISBA_OI. It is activated by setting CASSIM_ISBA="OI" in NAM_ASSIM (default option).

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
CASSIM_ISBA	character(LEN=5)	EKF/OI	OI	

9.4.3 NAM_NACVEG

The namelist NAM_NACVEG controls the time interval and the observation/background settings for OI_main (oi_cacsts).

Name	Type	Values	Default	X-Reference
NECHGU	integer		6	
XRCLIMCA	real		0.	
XRCLISST	real		0.05	
XSIGH2MO	real		0.1	
XSIGT2MO	real		1.0	
XSIGWGO	real		0.06	
XSIGWGB	real		0.06	
XSIGW2B	real		0.03	
LOBSWG	logical		T	
LOBS2M	logical		F	
LIMVEG	logical		T	
XSPRECIP2	real		4.0	
XRTHR_QC	real		3.0	
XSIGWGO_MAX	real		6.0	
XRSCAL_JAC	real		4.0	

- NECHGU: coefficient for OI and number of hours separating 2 observation times.
- XRCLIMCA: nudging coefficient to the climatology of surface fields.
- XRCLISST: nudging coefficient to the climatology of SST
- XSIGH2MO: standard deviation of the "observation" error for Hu2m
- XSIGT2MO: standard deviation of the "observation" error for T2m
- XSIGWGO: observation error for WG
- XSIGWGB: background error for WG
- XSIGW2B: background error for W2
- LOBSWG: if T, assimilation of WG
- LOBS2M: if T, assimilation of T2M + RH2M (with WG)
- LIMVEG: activation of limitation at wp > veg*wwilt
- XSPRECIP2: coefficient for OI.
- XRTHR_QC: coefficient for OI.
- XSIGWGO_MAX: maximum acceptable WG obs error (
- XRSCAL_JAC: to modify the "effective" assimilation window.

9.4.4 ISBA: EKF soil assimilation

The Extended Kalman Filter (EKF) is an option to be used on several soil properties. At the moment TG1/2, WG1/2 and LAI can be used as control variables. Extended Kalman Filter is activated by setting CASSIM_ISBA="EKF" in NAM_ASSIM:

NAM_ASSIM				
Name	Type	Values	Default	X-Reference
CASSIM_ISBA	character(LEN=5)	EKF/OI	OI	

Before EKF can be used you have to run the same number of perturbed offline runs as the number of control variables you are using in addition to an unperturbed control run.

This can be set in NAM_IO_VARASSIM:

NAM_IO_VARASSIM				
Name	Type	Values	Default	X-Reference
LPRT	logical		F	

When running the assimilation, the initalization is done by reading the total number of perturbed runs (+ the unpertubed) and storing the relevant fields for assimilation in memory. In inline mode an additional reading is done, which ideally should be removed.

NB! At the moment the internal matrices are stored as text files pr. individual CPUs. It means you can not change the number of CPUs used (or control variables) from one cycle to the next unless you start from a "cold" start with no existing matrices.

The following links contain documentation and example files to run SODA-EKF in SURFEX V8.1:

https://opensource.umr-cnrm.fr/projects/openldasmonde/wiki/

https://www.umr-cnrm.fr/spip.php?article1022

9.4.5 NAM_ASSIM

General assimilation namelist used only with SODA. Note that NBOUTPUT should be moved in NAM_OBS for more consistency.

Name	Type	Values	Default	X-Reference
LASSIM	logical		F	
CASSIM	character(LEN=5)	"PLUS ","2DVAR" , "AVERA"	"PLUS "	
CASSIM_ISBA	character(LEN=5)	"OI ","EKF ", "ENKF"	"OI "	
NPRINTLEV	integer		0	
LAROME	logical		T	
LECSST	logical		F	
LAESST	logical		F	
LAESNM	logical		F	
LALADSURF	logical		T	
LREAD_SST_FROM_FILE	logical		F	
CFILE_FORMAT_SST	character(LEN=5)	"FA ", "ASCII"	"FA "	
CFILE_FORMAT_FG	character(LEN=5)	"FA ", "ASCII"	"FA "	
CFILE_FORMAT_LSM	character(LEN=5)	"FA ", "ASCII"	"FA "	
CFILE_FORMAT_CLIM	character(LEN=5)	"FA ", "ASCII"	"FA "	
LEXTRAP_SEA	logical		T	
LEXTRAP_WATER	logical		T	
LEXTRAP_NATURE	logical		F	
LWATERTG2	logical		F	
NBOUTPUT	integer		1	

- LASSIM: if T, reads 2M and 10M isba variables in input file, in OI case. Needed to run SODA.
- CASSIM: type of correction
- CASSIM_ISBA: switch OI / EKF / ENKF.
- NPRINTLEV: to print more or less information on screen.
- LAROME: T if the input atmospheric file for SODA comes from AROME (the names of variables read are different).
- LECSST: if T, SST is read in an ECMWF file.
- LAESST: if T, SST analysis is set from CANARI.

- LAESNM: if T, snow is updated from analysed CANARI values.
- LALADSURF: if T, EVAP can not be read in input atmospheric file, and is set to 0.
- LREAD_SST_FROM_FILE: if T, SST is read in a specific input file.
- CFILE_FORMAT_SST: Format of the SST file ASCII/FA
- CFILE_FORMAT_FG: Format of the first guess file ASCII/FA (OI)
- CFILE_FORMAT_LSM: Format of the LSM file ASCII/FA (OI/extrapolations)
- CFILE_FORMAT_CLIM: Format of the climate file ASCII/FA (OI)
- LEXTRAP_SEA: if T, SST is extrapoled (vertical extrapolation only, input and ouput LAT and LON are the same).
- LEXTRAP_WATER: idem for Water Surface Temperature.
- LEXTRAP_NATURE: idem for isba variables (WG1, WG2, TG1, TG2, TG3, WGI2, WSNOW(NLAYER), SNOWRHO(NLAYER), SNOWALB).
- LWATERTG2: if T, Water Temperature is taken from nature TG2, with an extrapolation if LEXTRAP_WATER=T.
- NBOUTPUT: number of observation times to be read. NECHGU is the number of hours separating two observation times.

9.4.6 NAM_VAR

Specific namelist for the control variables for EKF.

Name	Type	Values	Default	X-Reference
NIVAR	integer		1	
NVAR	integer	≤ 5	4	
CVAR_M	character(LEN=5)		"WG2", "WG1", "TG2" "TG1" ,"LAI"	
CREPFIX_M	character(LEN=100)(5)		""	
XSIGMA_M	real(5)		0.15, 0.1, 2.0, 2.0,0.2	
XTPRT_M	real(5)		0.0001, 0.0001, 0.0001 0.0001, 0.001	
NNCV	integer(5)		1, 1, 1, 1, 1	
XSCALE_Q	real		0.125	
XSCALE_QLAI	real		0.5	
CBIO	character(LEN=12)	"BIOMA1", "BIOMASS1" "BIOMA2", "BIOMASS2" "RESPI1", "RESP_BIOM1" "RESPI2", "RESP_BIOM2" "LAI"	"BIOMA1"	
CPREFIX_BIO	character(LEN=100)		""	
XALPH	real(12)		0., 0., 0., 0.08203445 0.07496252, 0.06846970 0.06771856, 0.09744689 0.09744689, 0.07164350 0.17686594, 0.07164350	

- NIVAR: number of the variable to be perturbed at reading in input PREP file.
- NVAR: number of control variables.
- CVAR_M: names of control variables.

- CPREFIX_M: The prefix of the control variables (in PREP.txt file). Used only with VARASSIM.
- XSIGMA_M: covariances of background errors if B is fixed.
- XTPRT_M: The perturbation amplitudes.
- NNCV: selects the control variables to be used: if 1, used, if 0, not used.
- XSCALE_Q: scaling factor of Q matrix w.r.t. the initial B.
- XSCALE_QLAI: scaling factor of Q matrix w.r.t. the initial B, for LAI variable.
- CBIO: Name of Biomass variable
- CPREFIX_BIO: The prefix of the Biomass variable Used only in VARASSIM, useless in SODA/EKF.
- XALPH: coefficient for BIO_PASS, by patch.

9.4.7 NAM_OBS

Specific namelist for the observations in EKF.
For the moment, 5 types of observation are possible: "T2M", "HU2M", "WG1", "LAI" and "SWE".

Name	Type	Values	Default	X-Reference
NOBSTYPE	integer	≤ 5	2	
LOBSHEADER	logical		F	
CFILE_FORMAT_OBS	character	"FA ", "ASCII"	"FA "	
LOBSNAT	logical		F	
COBS_M	character(LEN=10)(5)		"T2M ","HU2M", "WG2 ","LAI ", "SWE "	
XERROBS_M	real(5)		1.0, 0.1, 0.4,0.2,0.1	
NNCO	integer(5)		1, 1, 0,0,0	

- NOBSTYPE: number of different observed variables.
- LOBSHEADER: is there a header in the observation file
- CFILE_FORMAT_OBS: Format of the observations file ASCII/FA
- LOBSNAT: if observations and assimilation are defined only on nature tile
- COBS_M: array containing the names of the fields for observations, in case of data assimilation.
- XERROBS_M: observation error for each type.
- NNCO: selects the type of observations to be assimilated: 1 assimilated, 0: not assimilated. Index 1 corresponds to T2M, index 2 to HU2M, index 3 to WG1, index 4 to LAI, index 5 to SWE.

9.4.8 NAM_IO_VARASSIM

General SODA EKF options. Note that LBEV and LBFIXED are exclusive, and could a priori be reduced to one single logical.

Name	Type	Values	Default	X-Reference
LSIM	logical		F	
LPRT	logical		F	
LBEV	logical		F	
LBFIXED	logical		F	

- LSIM: if T, write the simulated observations and the evolved state vector, else perform analysis. Not needed any more. To be removed.

- LPRT: if T, TG1/2 and WG1/2 can be perturbed at reading of the input PREP file, using the pertubation coefficient TPRT (cf NAM_VAR). Should be true for the perturbed offline runs.
- LBEV: if T, B will be evolved in time.
- LBFIXED: if LBEV is F, LBFIXED must be T (it's the alternative, B fixed in time).

9.4.9 ISBA: ENKF soil assimilation

This scheme was developed by David Fairbairn.

It is the ENsemble Kalman Filter derived from the EKF scheme.

The main difference is that variables perturbations are randomly set.

It uses NAM_ASSIM, NAM_VAR, NAM_OBS and a new namelist, NAM_ENS.

Name	Type	Values	Default	X-Reference
NENS	integer		1	
NIE	integer		0	
XASSIM_WINH	real		24	
XINFL_M	real(NVARMAX)		0.,0.,0.,0.,0.	
XADDINFL_M	real(NVARMAX)		0.,0.,0.,0.,0.	
XADDTIMECORR_M	real(NVARMAX)		0.,0.,0.,0.,0.	
LENS_GEN	logical		T	
LPB_CORRELATIONS	logical		F	
LPERTURBATION_RUN	logical		F	
LBIAS_CORRECTION	logical		F	
LENKF	logical		F	
LDENKF	logical		F	

- NENS: number of members in the ensemble
- NIE: number of the ensemble that is modified during the current OFFLINE run.
- XASSIM_WINH: used to add the noise to the variables.
- XINFL_M: used to calculate new variable during assimilation.
- XADDINFL_M: used to calculte the noise added to the variables.
- XADDTIMECORR_M: used to add the noise to the variables.
- LENS_GEN: used at first assimilation day, to initialize the ensemble.
- LPB_CORRELATIONS: if T, used for 2D enkf.
- LPERTURBATION_RUN: if F, the assimilation is performed.
- LBIAS_CORRECTION: if T, bias is corrected.
- LENKF: if T, the innovation is calculated.
- LDENKF: if T, variables are modified according to R.

9.4.10 Extrapolation of ISBA properties

Independent of which scheme which is used for nature, there is an option to extrapolate nature variables for points having a nature fraction in SURFEX but a CANARI land-sea mask as water. The variables are extrapolated from the nearest point having land in CANARI and nature in SURFEX.

NAM_ASSIM:

Name	Type	Values	Default	X-Reference
LEXTRAP_NATURE	logical		F	

- LEXTRAP_NATURE: if T, extrapolation is performed.

The variables extrapolated are:
- TG1/2/3 (with height adjustment)
- WG1/2
- WGI1
- Snow (SWE/density and albedo)

9.5 Urban tile

All points containing a fraction of town enter the same call tree. In this section the namelist settings and alghoritms will be explained.

9.5.1 TEB: Update T_ROAD3 from T2M_TEB

When running TEB the third level road temperature is always updated with the screen level temperature for the TEB fraction.

10 Coupling with OASIS-MCT

For more details see "Description for the coupling of SURFEX with OASIS by Bertrand Decharme" **??**

10.1 NAM_SFX_LAND_CPL

Name	Type	Values	Default	X-Reference
XTSTEP_CPL_LAND	real		-1.0	
XFLOOD_LIM	real		0.01	
CRUNOFF	character(LEN=8)		""	
CDRAIN	character(LEN=8)		""	
CCALVING	character(LEN=8)		""	
CWTD	character(LEN=8)		""	
CFWTD	character(LEN=8)		""	
CFFLOOD	character(LEN=8)		""	
CPIFLOOD	character(LEN=8)		""	
CSRCFLOOD	character(LEN=8)		""	
CDOCFLUX	character(LEN=8)		""	
CTWS	character(LEN=8)		""	

- XTSTEP_CPL_LAND: Coupling time step for land
- XFLOOD_LIM: threshold above which no flood for very small flooded area (default 1%)
- CRUNOFF: Name of Surface runoff variable from SFX to TRIP
- CDRAIN: Name of Deep drainage variable from SFX to TRIP
- CCALVING: Name of Calving flux variable from SFX to TRIP
- CWTD: water table depth from SFX to TRIP
- CFWTD: grid-cell fraction of water table rise from SFX to TRIP
- CFFLOOD: Name of Floodplains recipitation interception variable from SFX to TRIP
- CPIFLOOD: Flood potential infiltration from SFX to TRIP
- CSRCFLOOD: Floodplains freshwater flux froM SFX to TRIP
- CDOCFLUX: coupling DOC flux when LCLEACH = T (in NAM_ISBA_CCn)
- CTWS: coupling variable that allow to compute the Terrestrial Water Storage (TWS) that is the sum of all water over continent in each grid-cell (water on leaf, snow and soil moisture from ISBA, and lakes, inundations, aquifers from CTRIP).

10.2 NAM_SFX_LAKE_CPL

Name	Type	Values	Default	X-Reference
XTSTEP_CPL_LAKE	real		-1.0	
CLAKE_EVAP	character(LEN=8)		' '	
CLAKE_RAIN	character(LEN=8)		' '	
CLAKE_SNOW	character(LEN=8)		' '	
CLAKE_WATF	character(LEN=8)		' '	

- XTSTEP_CPL_LAKE: Coupling time step for lake
- CLAKE_EVAP: Evaporation over lake area
- CLAKE_RAIN: Rainfall over lake area
- CLAKE_SNOW: Snowfall over lake area
- CLAKE_WATF: Net freshwater flux

10.3 NAM_SFX_SEA_CPL

Name	Type	Values	Default	X-Reference
XTSTEP_CPL_SEA	real		-1.0	
LWATER	logical		F	
LSEAICE_2FLX	logical		F	
CSEA_FWSU	character(LEN=8)		' '	
CSEA_FWSV	character(LEN=8)		' '	
CSEA_HEAT	character(LEN=8)		' '	
CSEA_SNET	character(LEN=8)		' '	
CSEA_WIND	character(LEN=8)		' '	
CSEA_FWSM	character(LEN=8)		' '	
CSEA_EVAP	character(LEN=8)		' '	
CSEA_RAIN	character(LEN=8)		' '	
CSEA_SNOW	character(LEN=8)		' '	
CSEA_WATF	character(LEN=8)		' '	
CSEA_PRES	character(LEN=8)		' '	
CSEAICE_HEAT	character(LEN=8)		' '	
CSEAICE_SNET	character(LEN=8)		' '	
CSEAICE_EVAP	character(LEN=8)		' '	
CSEA_SST	character(LEN=8)		' '	
CSEA_UCU	character(LEN=8)		' '	
CSEA_VCU	character(LEN=8)		' '	
CSEAICE_SIT	character(LEN=8)		' '	
CSEAICE_CVR	character(LEN=8)		' '	
CSEAICE_ALB	character(LEN=8)		' '	
CSEA_CO2	character(LEN=8)		' '	
CSEA_FCO2	character(LEN=8)		' '	

- XTSTEP_CPL_SEA: Coupling time step for lake
- LWATER: Switch to add water into sea oasis mask
- LSEAICE_2FLX: flag to activate a tile scheme to compute fluxes over sea and sea-ice separately
- CSEA_FWSU: zonal wind stress
- CSEA_FWSV: meridian wind stress
- CSEA_HEAT: Non solar net heat flux
- CSEA_SNET: Solar net heat flux
- CSEA_WIND: module of 10m wind speed
- CSEA_FWSM: module of wind stress
- CSEA_EVAP: Evaporation
- CSEA_RAIN: Rainfall
- CSEA_SNOW: Snowfall
- CSEA_WATF: Net freshwater flux
- CSEA_PRES: Surface pressure over sea
- CSEAICE_HEAT: Sea-ice non solar net heat flux
- CSEAICE_SNET: Sea-ice solar net heat flux
- CSEAICE_EVAP: Sea-ice sublimation

- CSEA_SST: Sea surface temperature
- CSEA_UCU: Sea u-current stress
- CSEA_VCU: Sea v-current stress
- CSEAICE_SIT: Sea-ice temperature
- CSEAICE_CVR: Sea-ice cover
- CSEAICE_ALB: Sea-ice albedo
- CSEA_CO2: coupling variable that allow to send cumulated atmospheric CO2 in ppm.s to ocean model
- CSEA_FCO2: coupling variable that allow to get CO2 fluxes produces by the oceanic biogeochemistry scheme

10.4 NAM_SFX_WAVE_CPL

Name	Type	Values	Default	X-Reference
XTSTEP_CPL_WAVE	real		-1.0	
CWAVE_U10	character(LEN=8)		' '	
CWAVE_V10	character(LEN=8)		' '	
CWAVE_CHA	character(LEN=8)		' '	
CWAVE_UCU	character(LEN=8)		' '	
CWAVE_VCU	character(LEN=8)		' '	
CWAVE_HS	character(LEN=8)		' '	
CWAVE_TP	character(LEN=8)		' '	

- XTSTEP_CPL_WAVE: Coupling time step for waves
- CWAVE_U10: zonal component of the wind at 10 meters (or at first atmospheric level if below 10 m)
- CWAVE_V10: meridian component of the wind at 10 meters (or at first atmospheric level if below 10 m)
- CWAVE_CHA: Charnock coefficient
- CWAVE_UCU: zonal surface current (from wave model)
- CWAVE_VCU: meridian surface current (from wave model)
- CWAVE_HS: significant height
- CWAVE_TP: peak period

Appendices

A List of ECOCLIMAP cover names

ECOCLIMAP I

COVER 1 : Sea and ocean
COVER 2 : Inland waters
COVER 3 : Rivers
COVER 4 : Bare land
COVER 5 : Rocks
COVER 6 : Permanent snow and ice
COVER 7 : Urban and built-up
COVER 8 : Tropical undefined islands
COVER 9 : Subpolar undefined islands

ENF = Evergreen Needleleaf Forest
COVER 10 : S-America cool ENF
COVER 11 : Boreal ENF
COVER 12 : Asia subtropical ENF
COVER 13 : American Continental ENF
COVER 14 : American Subtropical ENF
COVER 15 : American Cool Marine ENF

EBF = Evergreen Broadleaf Forest
COVER 16 : Africa Equatorial EBF
COVER 17 : Africa Tr. wind EBF
COVER 18 : Oceanian Equatorial EBF
COVER 19 : Asia tropical EBF
COVER 20 : Oceania tropical EBF
COVER 21 : Amazonian EBF
COVER 22 : SH subtropical EBF
COVER 23 : Cent. America Tr. wind EBF

DNF = Deciduous Needleleaf Forest
COVER 24 : Asian boreal DNF

DBF = Deciduous Broadleaf Forest
COVER 25 : S-America tropical DBF
COVER 26 : N-America humid continental DBF
COVER 27 : Cent. America Tr. wind DBF
COVER 28 : S-America humid subtropical DBF

MF = Mixed Forest
COVER 29 : Africa dry tropical MF
COVER 30 : S-America cool MF
COVER 31 : NH Subpolar MF
COVER 32 : NH Humid subtropical MF
COVER 33 : NH Continental MF

WL = Wood Land
COVER 34 : NH Africa WL
COVER 35 : SH Africa WL

COVER 36 : Tr. wind humid and subtrop. WL
COVER 37 : Oceanian Equatorial WL
COVER 38 : Asia wet tropical WL
COVER 39 : S-America tropical WL
COVER 40 : S-America humid subtropical WL
COVER 41 : NH Subpolar WL
COVER 42 : NH Continental WL
COVER 43 : Asia humid subtropical WL
COVER 44 : N-America Semi arid WL
COVER 45 : N-America moderate polar WL
COVER 46 : S-America moderate polar WL
COVER 47 : N-America humid subtropical WL

WG = Wooded Grassland
COVER 48 : NH Africa semiarid WG
COVER 49 : NH Africa dry tropical WG
COVER 50 : Africa dry equatorial WG
COVER 51 : SH Africa dry tropical WG
COVER 52 : Oceania tropical WG
COVER 53 : Oceania semiarid WG
COVER 54 : Oceania subtrop. cool marine WG
COVER 55 : Asia humid and subtropical WG
COVER 56 : S-America trop. and subtrop. WG
COVER 57 : S-America Tr. wind WG
COVER 58 : S-America semiarid WG
COVER 59 : NH Subpolar WG
COVER 60 : NH Continental WG
COVER 61 : Asia wet and dry tropical WG
COVER 62 : N-America semi arid WG
COVER 63 : N-America humid subtropical WG
COVER 64 : S-America moderate polar WG
COVER 65 : Cent. Amer. Tr. wind & trop. WG
COVER 66 : NH Africa dry summer subtrop. WG

CS = Closed Shrubland
COVER 67 : NH Africa arid CS
COVER 68 : NH Africa semiarid CS
COVER 69 : SH Africa semiarid CS
COVER 70 : Oceania arid CS
COVER 71 : Oceania, S-America semiarid CS
COVER 72 : Oceania Tr. wind CS
COVER 73 : SH dry summer subtropical CS
COVER 74 : Asia polar CS
COVER 75 : Asia continental CS
COVER 76 : Asia tropical CS
COVER 77 : N-America polar CS
COVER 78 : N-America continental CS
COVER 79 : NH Africa dry summer subtrop. CS

OS = Open Shrubland
COVER 80 : NH arid OS
COVER 81 : NH semiarid tropical OS
COVER 82 : SH Africa and Oceania arid OS
COVER 83 : S-America semiarid tropical OS

COVER 84 : Asia dry tropical OS
COVER 85 : NH Polar OS
COVER 86 : N-America Subpolar OS
COVER 87 : N-America semiarid continental OS

G = Grassland
COVER 88 : Africa wet Tropical G
COVER 89 : NH Africa Semiarid G
COVER 90 : SH Africa Semiarid G
COVER 91 : S-America, Oceania equatorial G
COVER 92 : S-America, Oceania Semiarid G
COVER 93 : Oceania cool littoral G
COVER 94 : Asia wet and dry tropical G
COVER 95 : NH S-America wet tropical G
COVER 96 : SH S-America wet tropical G
COVER 97 : S-America semiarid G
COVER 98 : S-America moderate polar G
COVER 99 : NH semiarid Continental G
COVER 100 : Asia Subpolar G
COVER 101 : Asia humid Continental G
COVER 102 : Asia semiarid tropical G
COVER 103 : N-America continental G
COVER 104 : Asia humid subtropical G

C = Crops
COVER 105 : NH Africa arid C
COVER 106 : NH Africa, Asia wet and dry trop. C
COVER 107 : SH Africa wet and dry tropical C
COVER 108 : SH Afr. Tr. wind & semiarid trop. C
COVER 109 : Oceania dry summer subtropical C
COVER 110 : Cent. & S-Amer., Oceania Tr. wind C
COVER 111 : S-America humid subtropical C
COVER 112 : SH S-America tropical C
COVER 113 : N-Amer., Asia semiarid continental C
COVER 114 : Asia humid continental C
COVER 115 : Asia humid subtropical C
COVER 116 : Asia subpolar C
COVER 117 : Asia semiarid tropical C
COVER 118 : N-America humid continental C
COVER 119 : N-America humid subtropical C
COVER 120 : NH dry summer subtropical C
COVER 121 : NH Africa dry summer subtropical C
COVER 122 : SH Africa dry summer subtropical C
COVER 123 : Bare soil with sparse polar vegetation
COVER 124 : Warm subtropical wetlands
COVER 125 : Subpolar wetlands

COVER 151 : Dense urban
COVER 152 : Mediterranean sub-urban
COVER 153 : Temperate sub-urban
COVER 154 : Cold sub-urban
COVER 155 : Industries and commercial areas
COVER 156 : Road and rail networks
COVER 157 : Port facilities

COVER 158 : Airport
COVER 159 : Mineral extraction, construction sites
COVER 160 : Urban parks
COVER 161 : Sport facilities
COVER 162 : Spanish crops
COVER 163 : Estremadura crops
COVER 164 : Mediterranean crops
COVER 165 : Atlantic coast crops
COVER 166 : Temperate crops
COVER 167 : Po plain crops
COVER 168 : Warm temperate crops
COVER 169 : Ukrainian crops
COVER 170 : Subpolar crops
COVER 171 : Mountain crops
COVER 172 : Central Europe crops
COVER 173 : Turkish crops
COVER 174 : Mediterranean irrigated crops
COVER 175 : Irrigated crops
COVER 176 : Rice fields
COVER 177 : Mediterranean vineyards
COVER 178 : Temperate vineyards
COVER 179 : Mediterranean fruit trees
COVER 180 : Temperate fruit trees
COVER 181 : Olive groves
COVER 182 : Temperate pastures
COVER 183 : Atlantic border pastures
COVER 184 : Central and Eastern Europe pastures
COVER 185 : Ukrainian pastures
COVER 186 : Subpolar pastures
COVER 187 : Spanish complex cultivation pattern
COVER 188 : Mediter. complex cultivation pat.
COVER 189 : Temperate complex cultivation pat.
COVER 190 : French complex cultivation pat.
COVER 191 : Balkanish complex cultivation pat.
COVER 192 : Mediterranean crops and woodland
COVER 193 : Crops and woodland
COVER 194 : French crops and woodland
COVER 195 : Balkanish crops and woodland
COVER 196 : Spanish crops and woodland
COVER 197 : Baltic states crops and woodland
COVER 198 : Agro-forestry areas
COVER 199 : Spanish broad-leaved forest
COVER 200 : Estremadura broad-leaved forest
COVER 201 : Mediterranean broad-leaved forest
COVER 202 : Atlantic coast broad-leaved forest
COVER 203 : Temperate broad-leaved forest
COVER 204 : Moutain broad-leaved forest
COVER 205 : Balkanish broad-leaved forest
COVER 206 : Subpolar broad-leaved forest
COVER 207 : Black Sea broad-leaved forest
COVER 208 : Mediterranean pines
COVER 209 : Landes forest
COVER 210 : Moutain coniferous forest
COVER 211 : Temperate coniferous forest

COVER 212 : Subpolar Taiga
COVER 213 : Russian Taiga
COVER 214 : Turkish coniferous forest
COVER 215 : Mediterranean mixed forest
COVER 216 : Atlantic coast & french mixed forest
COVER 217 : Subpolar mixed forest
COVER 218 : Mountain mixed forest
COVER 219 : Eastern Europe mixed forest
COVER 220 : Mediterranean GR
COVER 221 : Atlantic coast GR
COVER 222 : Balkanish GR
COVER 223 : Estremadura GR
COVER 224 : Subpolar GR
COVER 225 : Tundra
COVER 226 : Turkish moors
COVER 227 : Mediter. moors & heath lands
COVER 228 : Moutain moors & heath lands
COVER 229 : Atlantic coast moors & heath lands
COVER 230 : Turkish shrubland
COVER 231 : Mediterranean maquis
COVER 232 : Moutain maquis
COVER 233 : Spanish woodland
COVER 234 : Mediterranean woodland
COVER 235 : Temperate woodland
COVER 236 : Sparsely vegetated areas
COVER 237 : Burnt areas
COVER 238 : Temperate wetlands
COVER 239 : Subpolar wetlands
COVER 240 : Peat bogs
COVER 241 : Salines and salt marshes
COVER 242 : Intertidal flats
COVER 243 : Coastal lagoons

ECOCLIMAP II EUROPE

forests
COVER 301 : N SCANDINAVIA TUNDRA1
COVER 302 : OURAL BF1
COVER 303 : CARELIE BF1
COVER 304 : NORTH RUSSIAN TAIGA1
COVER 305 : NORTH RUSSIAN TAIGA2
COVER 306 : CARELIE BF2
COVER 307 : RUSSIAN TAIGA3
COVER 308 : RUSSIAN BF1
COVER 309 : RUSSIAN TAIGA4
COVER 310 : S SCANDINAVIA TAIGA1
COVER 311 : SOUTH FINLANDIA MF1
COVER 312 : SOUTH NORWAY MF1
COVER 313 : BALTIC BF1
COVER 314 : BALTIC MF1
COVER 315 : SOUTH SWEDEN CF1
COVER 316 : BALTIC MF2
COVER 317 : SOUTH SWEDEN CF2
COVER 318 : SOUTH SWEDEN CF3

COVER 319 : SOUTH SWEDEN MF1
COVER 320 : MOUNTAIN MF1
COVER 321 : MOUNTAIN BF1
COVER 322 : TEMPERATE BF1
COVER 323 : TEMPERATE COMPLEX1
COVER 324 : MOUNTAIN CF1
COVER 325 : TEMP HERBACEOUS CF1
COVER 326 : ATLANTIC COAST BF1
COVER 327 : TURKISH CF1
COVER 328 : BALKAN CF1
COVER 329 : N SPAIN HERBAC MF1
COVER 330 : TEMP SW HERBAC CF1
COVER 331 : ATLANTIC COMPLEX1
COVER 332 : N SPAIN HERBAC MF2
COVER 333 : MEDITER COMPLEX1
COVER 334 : MEDITER COMPLEX2
COVER 335 : MEDITER COMPLEX3
COVER 336 : MEDITER COMPLEX4
COVER 337 : MEDITER COMPLEX5
COVER 338 : BURNT PORT HERBAC CF1
COVER 339 : BURNT PORT HERBAC BF1
COVER 340 : EGEE COAST COMPLEX1
COVER 341 : W MED COAST COMPLEX1
COVER 342 : MAGHR HERBACEOUS MF1
COVER 343 : ESTREM HERBACEOUS MF1

herbaceous / shrub covers

COVER 344 : POLAR MOUNT TUNDRA1
COVER 345 : POLAR MOUNT TUNDRA2
COVER 346 : S SCANDINAVIA TUNDRA1
COVER 347 : NORTH TUNDRA1
COVER 348 : S SCANDINAVIA TUNDRA2
COVER 349 : NORTH RUSSIA TUNDRA1
COVER 350 : ARAL CONTINENTAL GR1
COVER 351 : MOUNTAIN TAIGA MOORS1
COVER 352 : SCOTTISH SWAMP MOORS1
COVER 353 : ATLANTIC COMPLEX2
COVER 354 : ATLANTIC GR1
COVER 355 : IR SCOT SWAMP MOORS1
COVER 356 : ASIAN SPARSE GR1
COVER 357 : AS SPARSE SW COMPLEX1
COVER 358 : N CASPIAN DES OS1
COVER 359 : ATLAS AS SPARSE COMP1
COVER 360 : SPARSE SCO CEN EU GR1
COVER 361 : TEMPERATE COMPLEX2
COVER 362 : ATLANTIC COMPLEX3
COVER 363 : ATLANTIC COMPLEX4
COVER 364 : N ATLANTIC PASTURES1
COVER 365 : SPARSE SCO CEN EU GR2
COVER 366 : SPARSE MOUNT E EU GR1
COVER 367 : TUR N CASP CONT GR1
COVER 368 : N CASPIAN CONT GR1
COVER 369 : IRA N CASP CONT GR1
COVER 370 : TUR IRA MOUNT CONT GR1

COVER 371 : E CASPIAN DES OS1
COVER 372 : N CASPIAN COMPLEX1
COVER 373 : IRAN MOUNT CONT GR1
COVER 374 : ASIAN SPARSE DES OS1
COVER 375 : E CASPIAN DES OS2
COVER 376 : N MEDITER COMPLEX1
COVER 377 : N MEDITER COMPLEX2
COVER 378 : ASIAN MEDIT CONT GR1
COVER 379 : SOUTH RUSSIA CONT GR1
COVER 380 : BLSEA SPARSE CONT GR1
COVER 381 : BLSEA SPARSE CONT GR2
COVER 382 : TURK MOUNT CONT GR1
COVER 383 : TURKISH COMPLEX1
COVER 384 : CAUCASIAN COMPLEX1
COVER 385 : N CASPIAN CONT GR2
COVER 386 : VOLGA VALLEY CONT GR1
COVER 387 : VOLGA VALLEY CONT GR2
COVER 388 : W CASPIAN CONT GR1
COVER 389 : CAUCASIAN COMPLEX2
COVER 390 : CAUCASIAN COMPLEX3
COVER 391 : BLSEA SPARSE CONT GR3
COVER 392 : CENT MASSIF COMPLEX1
COVER 393 : CENT MASSIF COMPLEX2
COVER 394 : TURK COAST COMPLEX1
COVER 395 : MESOPOTAMIA GR1
COVER 396 : TURK CILICIA COMPLEX1
COVER 397 : ASIAN COMPLEX1
COVER 398 : N MED SPARSE COMPLEX1
COVER 399 : MEDITER COMPLEX6
COVER 400 : MEDIT SPARSE COMPLEX1
COVER 401 : MEDIT SPARSE COMPLEX2
COVER 402 : MEDIT SPARSE COMPLEX3
COVER 403 : MEDIT SPARSE COMPLEX4
COVER 404 : N MED HERBACEOUS CF1
COVER 405 : ESTREMADURA GR1
COVER 406 : TUNISIA COMPLEX1
COVER 407 : TUNISIA HERBACEOUS1
COVER 408 : ALGERIA HERBACEOUS1
COVER 409 : DESERTIC HERBACEOUS1
COVER 410 : DESERTIC HERBACEOUS2
COVER 411 : SPAIN DES COMPLEX1
COVER 412 : MED SPARSE COMPLEX5
COVER 413 : MED SPARSE COMPLEX6
COVER 414 : MED SPARSE COMPLEX7
COVER 415 : ME SPARSE DES COMPL1
COVER 416 : NORTH ARABIA GR1
COVER 417 : N ARABIA DES COMPLEX1
COVER 418 : N ARABIA DESERTIC GR1
COVER 419 : MOROCCO HERBACEOUS1
COVER 420 : S MED COAST HERBAC1
COVER 421 : W MEDITER WOODLAND1
COVER 422 : S MED COAST HERBAC2
COVER 423 : MESOP DES HERBACEOUS1
COVER 424 : MAG COAST DES HERBAC1

COVER 425 : TU AR SPARSE HERBAC1
COVER 426 : MEDIT SPARSE COMPLEX8
COVER 427 : MED SPARSE HERBAC1
COVER 428 : MEDIT SPARSE COMPLEX9
COVER 429 : SPAIN SPARSE COMPLEX1
COVER 430 : N MED SPARSE COMPLEX2
COVER 431 : N MED SPARSE COMPLEX3
COVER 432 : MAGHRE DES HERBAC1
COVER 433 : MAGHRE DES HERBAC2
COVER 434 : MAGHRE DES HERBAC3
COVER 435 : N ARAB DES HERBAC1
COVER 436 : MESOPO DES HERBAC2
COVER 437 : TOURAN DES HERBAC1
COVER 438 : MESOPO DES HERBAC2
COVER 439 : TOURAN DES HERBAC2
COVER 440 : NEW ZEMBLE HERBAC1
COVER 441 : NEW ZEMBLE HERBAC2

crops
COVER 442 : TRANS SIBERIAN CROPS1
COVER 443 : PO PLAIN CROPS1
COVER 444 : PO PLAIN CROPS2
COVER 445 : SPANISH FRENCH CROPS1
COVER 446 : SPANISH FR ITAL CROPS1
COVER 447 : DANUBE PLAIN CROPS1
COVER 448 : N MED SPARSE COMPLEX4
COVER 449 : BALKAN CROPS1
COVER 450 : SPAIN FR ITAL CROPS2
COVER 451 : ATLANTIC CROPS1
COVER 452 : FR MED SPARSE CROPS1
COVER 453 : FR MED SPARSE CROPS2
COVER 454 : ATL MED SPARSE CROPS1
COVER 455 : BENE BLACK SEA CROPS1
COVER 456 : FRENCH ITALIAN CROPS1
COVER 457 : FR MED SPARSE CROPS3
COVER 458 : MEDITER SPARSE CROPS1
COVER 459 : ATLANTIC CROPS2
COVER 460 : NORTH ATLANTIC CROPS1
COVER 461 : SOUTH RUSSIA CROPS1
COVER 462 : S RUSSIA BALTIC CROPS1
COVER 463 : UKRAINIAN CROPS1
COVER 464 : EAST CARPATES CROPS1
COVER 465 : E CENT EUROPE CROPS1
COVER 466 : W CENT EU SW CROPS1
COVER 467 : HUNGARIAN CROPS1
COVER 468 : N BLACK SEA CROPS1
COVER 469 : HUNG BULG CAUC CROPS1
COVER 470 : SOUTH SWEDEN CROPS1
COVER 471 : SW RUSSIA CROPS1
COVER 472 : SOUTH RUSSIA CROPS1
COVER 473 : IRAN N CASPIAN CROPS1
COVER 474 : FR TEMP SPARSE CROPS1
COVER 475 : BULGARIAN CROPS1
COVER 476 : BULGARIAN CROPS2

COVER 477 : SP TURK SPARSE CROPS1
COVER 478 : FRENCH CENT EU CROPS1
COVER 479 : N BLACK SEA CROPS2
COVER 480 : BULGARIAN CROPS3
COVER 481 : POLE CROPS1
COVER 482 : POLE CROPS2
COVER 483 : N BLACK SEA CROPS3
COVER 484 : CENT EU SPARSE CROPS1
COVER 485 : GERMAN CROPS1
COVER 486 : BEAUCE CROPS1
COVER 487 : DANE CROPS1
COVER 488 : DANE CROPS2
COVER 489 : NEU ATL SPARSE CROPS1
COVER 490 : SYRIAN CROPS1
COVER 491 : GERMAN CROPS2
COVER 492 : CHANNEL CROPS1
COVER 493 : CHANNEL CROPS2
COVER 494 : ITALIAN CROPS1
COVER 495 : TURKISH CROPS1
COVER 496 : N MEDIT SPARSE CROPS1
COVER 497 : SPAIN TUR ARAB CROPS1
COVER 498 : NORTH SPAIN CROPS1
COVER 499 : MOROCCO TUNIS CROPS1
COVER 500 : MOROCCO CROPS1
COVER 501 : MOROCCO CROPS2
COVER 502 : ALGERIAN CROPS1
COVER 503 : MOROCCO CROPS3
COVER 504 : WEST SPAIN CROPS1
COVER 505 : MOROCCO CROPS4
COVER 506 : NORTH MEDITER CROPS1
COVER 507 : SOUTH SPANISH CROPS1
COVER 508 : SICILIAN CROPS1
COVER 509 : MAGHREB SPARSE CROPS1
COVER 510 : N MEDIT SPARSE CROPS2
COVER 511 : N MEDIT SPARSE CROPS3
COVER 512 : SP IT WCOAST CROPS1
COVER 513 : ESTREMADURA CROPS1
COVER 514 : ESTREMADURA CROPS2
COVER 515 : SP IT WCOAST CROPS2
COVER 516 : ESTREMADURA CROPS3
COVER 517 : MEDIT ISLANDS CROPS1
COVER 518 : SPAIN W COAST CROPS1
COVER 519 : ESTREMADURA CROPS4
COVER 520 : MECOAST SPARSE CROPS1
COVER 521 : BRITTANY CROPS1
COVER 522 : SYRIAN CROPS2

irrigated crops
COVER 523 : NIL VALLEY CROPS1
COVER 524 : NIL VALLEY CROPS2
COVER 525 : NIL VALLEY CROPS3
COVER 526 : NIL VALLEY CROPS4
COVER 527 : SPANISH IRR CROPS1
COVER 528 : NIL VALLEY CROPS5

COVER 529 : EGEE IRR CROPS1
COVER 530 : MEDITER IRR CROPS1
COVER 531 : S SPAIN IRR CROPS1
COVER 532 : NIL VALLEY CROPS6

bare land
COVER 533 : BARE ROCK1
COVER 534 : BARE ROCK2
COVER 535 : SANDY DESERT1
COVER 536 : BARE LAND1
COVER 537 : BARE LAND2
COVER 538 : BARE LAND3
COVER 539 : BARE LAND4
COVER 540 : BARE LAND5
COVER 541 : BARE LAND6
COVER 542 : BARE LAND7
COVER 543 : BARE LAND8
COVER 544 : BARE LAND9
COVER 545 : BARE LAND10
COVER 546 : BARE LAND11
COVER 547 : BARE LAND12
COVER 548 : PERMANENT SNOW1

swamp areas and inland waters
COVER 549 : INLAND WATERS1
COVER 550 : UNDEFINED1
COVER 551 : INLAND WATERS2
COVER 552 : POLAR WETLANDS1
COVER 553 : INLAND WATERS3
COVER 554 : INLAND WATERS4
COVER 555 : INLAND WATERS5
COVER 556 : INLAND WATERS6
COVER 557 : POLAR WETLANDS2
COVER 558 : SUBPOLAR WETLANDS1
COVER 559 : SUBPOLAR WETLANDS2
COVER 560 : SUBPOLAR WETLANDS3

urban
COVER 561 : TEMPERATE SUBURBAN1
COVER 562 : TEMPERATE SUBURBAN2
COVER 563 : TEMPERATE SUBURBAN3
COVER 564 : TEMPERATE SUBURBAN4
COVER 565 : TEMPERATE SUBURBAN5
COVER 566 : COLD SUBURBAN1
COVER 567 : WARM SUBURBAN1
COVER 568 : WARM SUBURBAN2
COVER 569 : TEMPERATE SUBURBAN6
COVER 570 : TEMPERATE SUBURBAN7
COVER 571 : WARM SUBURBAN3

added classes of permanent crops
COVER 572 : SPANISH VINEYARDS1
COVER 573 : LANGUEDOC VINEYARDS1

Appendices

B List of ECOCLIMAP-SG cover names

COVER 1: Sea and oceans COVER 2: Lakes
COVER 3: Rivers
COVER 4: Bare soil
COVER 5: Bare rock
COVER 6: Permanent snow
COVER 7: Boreal broadleaf deciduous
COVER 8: Temperate broadleaf deciduous
COVER 9: Tropical broadleaf deciduous
COVER 10: Temperate broadleaf evergreen
COVER 11: Tropical broadleaf evergreen
COVER 12: Boreal needleleaf evergreen
COVER 13: Temperate needleleaf evergreen
COVER 14: Boreal needleleaf deciduous
COVER 15: Shrubs
COVER 16: Boreal grassland
COVER 17: Temperate grassland
COVER 18: Tropical grassland
COVER 19: Winter C3 crops
COVER 20: Summer C3 crops
COVER 21: C4 crops
COVER 22: Flooded trees
COVER 23: Flooded grassland
COVER 24: Urban LCZ1 - compact high-rise
COVER 25: Urban LCZ2 - compact midrise
COVER 26: Urban LCZ3 - compact low-rise
COVER 27: Urban LCZ4 - open high-rise
COVER 28: Urban LCZ5 - open midrise
COVER 29: Urban LCZ6 - open low-rise
COVER 30: Urban LCZ7 - lightweight low-rise
COVER 31: Urban LCZ8 - large low-rise
COVER 32: Urban LCZ9 - sparsely built
COVER 33: Urban LCZ10 - heavy industry