

Companion note about CY43T2_bf source code version.
Export version for Aladin partners;
this note's version is for the original export based on CY43T2_bf.09 (10 July 2018)

1) Content of export files:

The source code and the associated configuration files defined for the initial export version based on CY43T2 are available on "hendrix" under the following directory tree:

hendrix:/home/martinezs/pub/export/cy43t2_bf.01

The content of the file system reads as follows:

- in directory "doc": the full technical memorandum of the bf versions .01 through .09 for CY43T2. In addition, the full tech' memo is appended to the e-mail announcement of the export version, along with a specific tech' memo of the last version release "bf.09" (also refer to Appendix 1 of this note).
- in directory "namelist": the namelist packages for ARPEGE and AROME-FRANCE used at MF for the OLIVE experimental configurations of 4D-VAR and 3D-VAR assimilation (resp.), as well as production forecasts and post-processing. For information, the associated OLIVE versioning of these configurations is "CY43T2_op1" (it is though based on the source codes and binaries of CY43T2_bf). These configurations were found to acceptably well reproduce the MF operational ones based on CY42_op2 (see below).
- in the directory "src": the source code files, in the usual file system organization inherited from the GCO-GIT repository.
- in directory "const": 2 files describing the location on "hendrix" of all required so-called "const" files (mostly RT-coeff files, RT-related emissivity atlases, B-matrix files as used in the MF assimilation systems etc.). See also Appendix 2 of this note for the complete list.

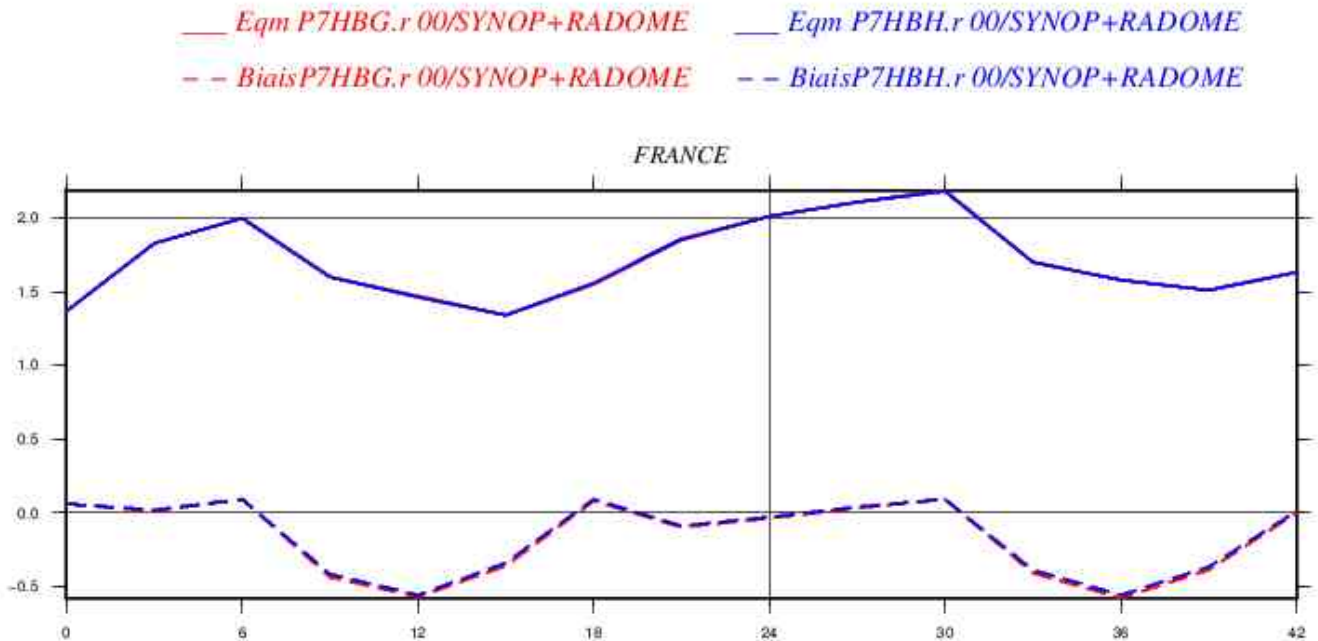
2) Results of Arome-France (based on OLIVE experimentation with CY43T2 bf):

The 2018-versions of CY43T2_bf.[04-09] in MF's GCO-GIT repository were built in order to progressively include all fixes required to run assimilation and be as close as possible, with CY43T2, to the operational MF Arpège and Arome versions of December 2017 (this means, compared with CY42_op2 and Surfex in Arpège, typically). Over time, a number of validation runs had been performed in MF's OLIVE environment in order to check the model results. A few specific illustrations of results are provided below.

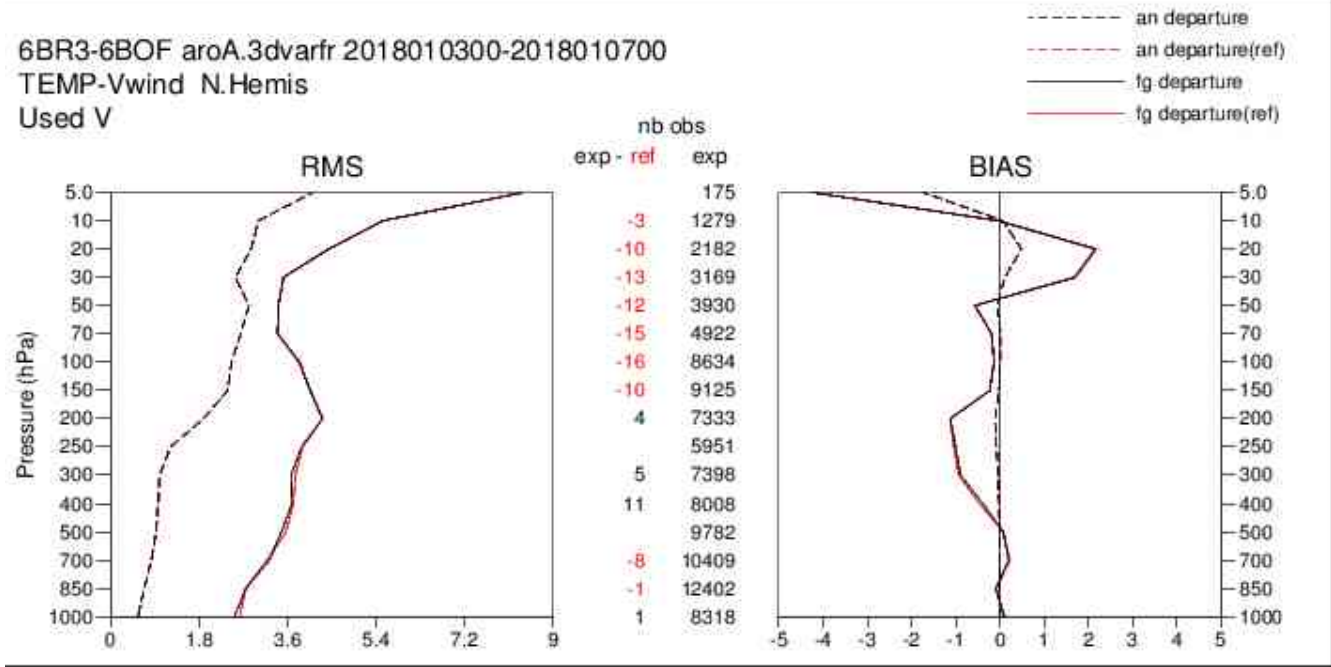
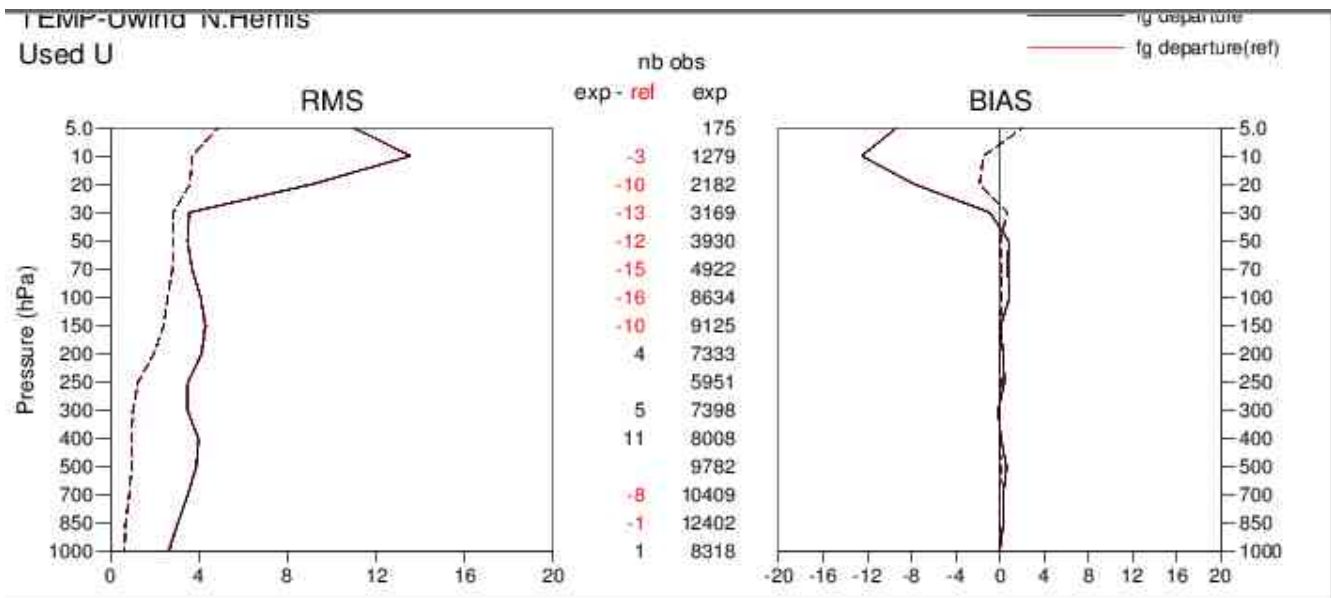
* one month of Arome-France forecasts using operational analyses as initial condition (and Arpège operational LBC files). Note: a specific PREP step had to be run in order to convert the SURFEX surface fields from version 7.3 (CY42_op2) into V8 (the test version here is CY43T2_bf.08).

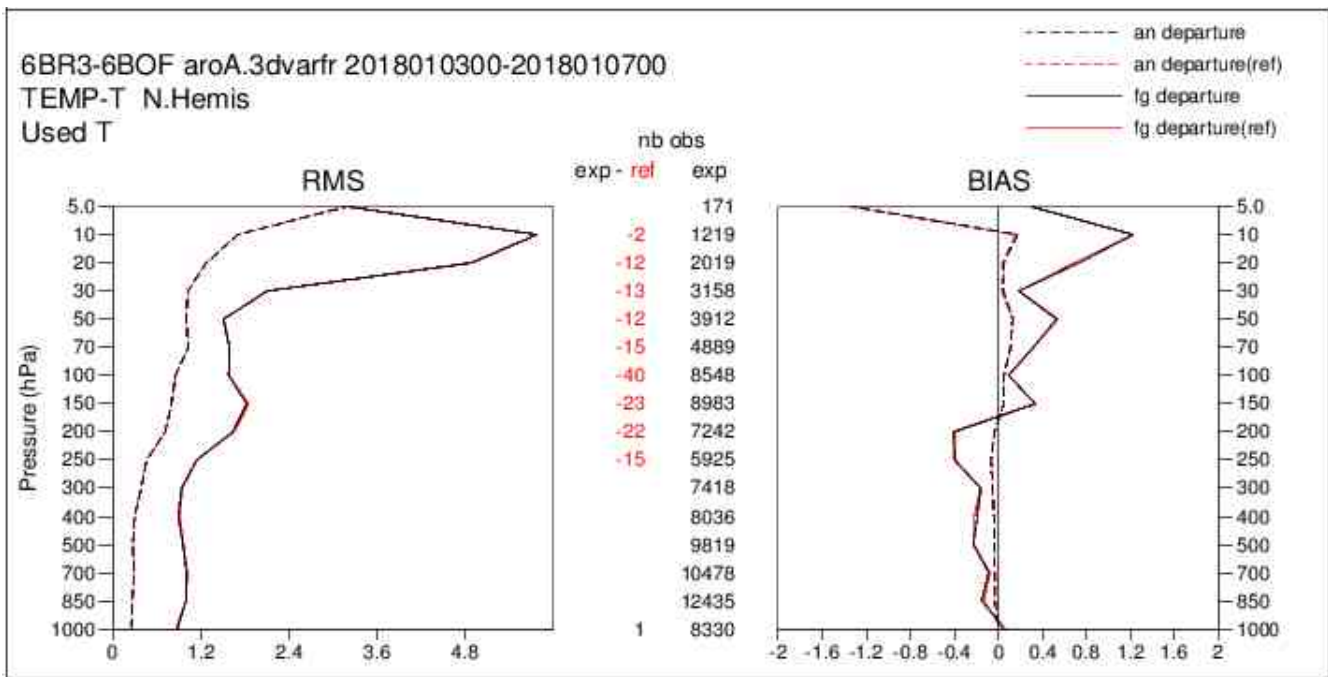
The impact when comparing scores near the surface, like T2m (for SYNOP and French meso-network) is very close to neutral. In the figure below, the operational is Red, the test is Blue.

30 simulations de 42h valides du 20171007 au 20171107



* one week of 3D-VAR/CANARI assimilation cycle. Note: the very first initial condition file had to be converted by a PREP step from Surfex V7.3 compatible to Surfex V8 compatible. Afterwards, all files and surface fields are cycled, and thus remain V8-compatible. The pictures below illustrate the statistics of Obstat, which provide bias and RMS in observation space for various observations types. The o-b stats are for b=1h forecast (1h cycle) and were computed over the full Arome-France domain (i.e. don't pay attention to the "N. Hemis." precision in the title caption). The plots below stand for TEMP observation space. "ref/Red" stand for operations (CY42_op2) and "exp/Black" stand for CY43T2_bf.08.





Note: there was no specific validation run performed for Arôme-France with the Aladin exported code version, CY43T2_bf.09, as this bf.09 only contains a very limited set of additional changes and fixes with respect to, for instance, bf.08 (see memo).

3) Results of Alaro tests with CY43T2 bf.08:

(Alaro team results / Work in progress)

4) Additional information (technical, Gmckpack, known differences of behavior of specific configurations etc.):

* Note for Digital Filter Blending application: in CY43T2_bf.09, a new setting of RNLGINC parameter (Ald/setup/suegem_naml.F90) leads to differences in the setup of the spectral diffusion for different grids (linear/quadratic/cubic: RNLGINC=0/1/2 resp., decimal numbers are possible). In previous cycles, the value of RNLGINC was truncated in setup in order to lie in the interval [0,1], while in CY43T2 it is in the interval [0,2]. This change causes non reproducibility of the spectral norms for DFI (digital filter initialization) used in DF Blending. It is advised to check the value of RNLGINC parameter in your output listing, and modify it via namelist if needed.

* CANARI:

- Observation positions *outside* the C+I model domain are not allowed anymore in CY43T2 (not even for the step of OI data selection). Note that Bator for instance is able to retain observations only in C+I via the “LAMFLAG” routine.
- LSLREJ specific sub-option: observations on land points, which would be surrounded by only sea or lake points in the model grid, are rejected in CY43T2. This change can affect the

numerical results of the CANARI surface analysis along coastal areas and peninsulas, when compared with older cycles.

- A bug was reported for specific settings of distributed memory in CANARI. CHMI has reported a crash with the print-out “MPL_ABORT: THRD 1 SLRSET: IFL IS OUT OF BOUND”. Two possible solutions to circumvent this problem are to either diminish the level of NS-distribution (decrease the value of NPRGPNS and likewise NPROC, provided this lower distribution is acceptable on your local HPC !), or change the value of the namelist variable RDISTR_E=0 (instead of 1) in NAMTRANS0. The satisfying solution would be to switch on B-level grid point distribution by setting NPRGPEW>1 (instead of 1), however this option was found to be bugged in CY43. The precise fix here is not yet available, awaiting for further technical investigations.
- Investigations are ongoing about a *possible* bug in the write-out of 10m wind fields (“CLSVENT.ZONAL/MERIDIEN”). Note: the fact that this field may be wrong (this is not yet clear as of today) does in principle have no effect neither on forecast production nor on assimilation configurations, since this field is not being used as an initial condition. It could however affect those who extensively use CANARI output for diagnostic purposes.

* PGD and clim files:

- for AROME models, i.e. using Surfex, we stress that the Surfex code version is changing for all users. Indeed, the CY40T1/Surfex version was V7.2+ and in CY41T1/CY42_op2 it was V7.3+ (the “+” stands for additional changes temporarily implemented in the NWP Surfex code, and generally committed to the Surfex official releases in version V8). In CY43T2, the version now is V8+.
- The change of version has practical consequences. According to the MF experience while testing AROME-France with CY43T1/T2, we recommend:
 - for simple, unit testing of AROME forecasts, it is possible to use PGD files and AROME input files (ICMSH) from an older cycle and Surfex version;
 - for a long test period of forecasts (typically two weeks or even one month) and scores, it is better to recompute the PGD file using CY43T2/Surfex-V8+.
 - In order to keep the orography field consistent between the (new) PGD and the local (old) clim files, a specific step has to be run which consists of building an FA-formatted PGD file containing the new PGD fields except for orography, which will be added from the (old) clim file. As a result, orography in the new PGD file remains as computed in Step 1 of *any* e923.
 - In addition, existing initial condition ICMSH files, from your operations, then also have to be converted by a specific step of PREP, from their old format (for instance CY40T1/V7.2+ if this is your present oper cycle) to the new format CY43T2/V8+.
 - MF can provide on request examples of scripts used to compute the PGD steps and/or the PREP step, originally in the case of Arome-France and on “beaufix”. For the PGD re-computation, partners can try running the script on “beaufix” with minor changes; for the PREP re-computation, adaptation to the local HPC should be done. Contacts at MF are C. Fischer or A. Mary.

* GMKPACK version: generally speaking, it is recommended to compile any Aladin source code version with a very recent version of GMKPACK. At the time of writing this note, the most recent

version of GMKPACK is 6.6.8. Nevertheless, any version equal or posterior to 6.6.3 should be OK for CY43. Please refer to Appendix 3 which lists the pre-compile directives activated in the MF compilation of CY43T2_bf.09. You may like to compare this list of -D parameters (i.e. used in #ifdef statements) with the one you're using in your local compile system.

* Ancillary libraries:

- [GRIB] MF is now using the GRIB_API interfaces provided within the “*ecCodes*” package from ECMWF (note that the former Grib_API libraries are not being maintained anymore at ECMWF). These interfaces give access to GRIB0, GRIB1 and GRIB2 functionalities. GRIB2 is becoming mandatory for MF's ARPEGE output files of the CY43T2 e-suite as it gives access to efficient compression options required for writing out the high resolution (T11798C2.2) global fields. Other I/O of MF's operational models, including all LAMs, are kept in GRIB1 or even in GRIB-Edition 0 equivalent writing (no change). The following recommendations hold:
 - In the CY43T2_bf.09 export version, linking with an ecCodes library is highly recommended. Partners are invited to use any version of ecCodes fairly close to v2.7.0. We recall that ecCodes is an ECMWF open-source package available at: <https://software.ecmwf.int/wiki/display/ECC/ecCodes+Home>
 - It is still possible to link with an old GRIB_API library, if you are for now using one at home. Note however that the export version has not been fully tested in this configuration. Therefore, support by other Aladin teams might be limited and according to local testing.
 - Regarding GRIB options in the partners' models, please keep your settings unchanged. For LAMs, the ecCodes GRIB2 interfaces are not yet ready (this is pending a specific action between MF, ECMWF and WMO) and there likely is no specific need for you to try GRIB2 compacting or compression anyway. Should any partner feel a need to test GRIB2 later, he could contact MF (P. Marguinaud & C. Fischer).
 - For completeness, we mention that a complete switch-off of GRIB2 definitions or GRIB2 handling inside the Aladin/Arome codes can be ensured by commenting (or deleting) the “#define FAGRIB2” line in resp. FAIGRA and FASGRA (two routines from the FA-file project).
- BATOR still uses gribex, which can be used along with the MF auxlibs installer 2.3. Furthermore, BATOR CY43T2 compilation requires modules from netcdf (4.4.4) and hdf5 (1.8.16) libraries. It has furthermore been reported that hdf5 should be compiled with --enable-fortran --enable-fortran2003.

* additional or on-the-fly technical information, reporting about installations, best practice, good tricks and FAQs may be found on the LACE forum which is kindly being proposed to host useful information for all ALADIN partners: <http://www.rclace.eu/forum/>

Appendix 1: additional documentation provided within the e-mail announcement (attached files).

1. MF/GCO tech' memorandum of the last bugfix branch version CY43T2_bf.09 (file "cy43t2_bf_v09.pdf")
2. MF/GCO full tech' memo of all updates of CY43T2_bf.[01-09] (file "memorandum_CY43T2_bf_v09.pdf")
3. auto-documented ALARO-1 forecast namelist (file "e001_ALARO-1_CY43T2bf09_commented.nam". Note that an ALARO-0 namelist can be provided only if requested by Partners. If so, please contact ACNA with French/LTM in cc.

Appendix 2: list of so-called "constant" files as defined in the MF OLIVE experimental context for CY43T2

these lists are the contents of the files "const.arpege.txt" and "const.arome.txt" located in the export package, in the directory "/home/martinezs/pub/export/cy43t2_bf.01/const" on "hendrix".

* file "const.arpege.txt":

```
/home/martinezs/pub/const/aearp/rtabwavelet/aearp.rtabwavelet.03.tar
/home/martinezs/pub/const/analyse/isba/analyse.isba.03
/home/martinezs/pub/const/atlas/amsua/atlas.amsua.03
/home/martinezs/pub/const/atlas/amsua/atlas.amsua.03
/home/martinezs/pub/const/atlas/amsub/atlas.amsub.03
/home/martinezs/pub/const/atlas/an1/atlas.an1.03
/home/martinezs/pub/const/atlas/an2/atlas.an2.03
/home/martinezs/pub/const/atlas/ssmis/atlas.ssmis.02
/home/martinezs/pub/const/coef/model/coef.model.02
/home/martinezs/pub/const/ecoclimap/covers/ecoclimap.covers.param.06.tgz
/home/martinezs/pub/const/emissivity_atlas/amsua/emissivity_atlas.amsua.03
/home/martinezs/pub/const/emissivity_atlas/amsub/emissivity_atlas.amsub.03
/home/martinezs/pub/const/emissivity_atlas/iasi/emissivity_atlas.iasi.01
/home/martinezs/pub/const/emissivity_atlas/ssmis/emissivity_atlas.ssmis.02
/home/martinezs/pub/const/errgrib/vor/errgrib.vor.07
/home/martinezs/pub/const/mask/atms/mask.atms.01
/home/martinezs/pub/const/mask/ssmis/mask.ssmis.02
/home/martinezs/pub/const/monitoring/seuils_obs/monitoring.seuils_obs.09.tgz
/home/martinezs/pub/const/param_bator/cfg/param_bator.cfg.42
/home/martinezs/pub/const/pgd_arpege/t1798/pgd_arpege.t1798.01.fa
/home/martinezs/pub/const/prescat/mle_norm/prescat.mle_norm.01
/home/martinezs/pub/const/prescat/nscat2/prescat.nscat2.noise.01
/home/martinezs/pub/const/prescat/qscat1/prescat.qscat1.table.01
/home/martinezs/pub/const/rrtm/const/rrtm.const.02.tgz
/home/martinezs/pub/const/rs/odhtable/rs.odhtable.COUNTRYRSTRHBIAS.01.tar
/home/martinezs/pub/const/rs/odhtable/rs.odhtable.RSTBIAS.01.tar
/home/martinezs/pub/const/rs/odhtable/rs.odhtable.SONDETYPERSTRHBIAS.01.tar
/home/martinezs/pub/const/scat/cmod5/scat.cmod5.table.03
/home/martinezs/pub/const/sea_ice/lonlat/sea_ice.lonlat.01
```

/home/martinezs/pub/const/var/amv/var.amv.bias_info.01
/home/martinezs/pub/const/var/amv/var.amv.tracking_error.01
/home/martinezs/pub/const/var/misc/var.misc.nn_total_weights.02
/home/martinezs/pub/const/var/sat/var.sat.misc_rtcoef.25.tgz
/home/martinezs/pub/const/var/srenorm/var.srenorm.arpege.tl224.01
/home/martinezs/pub/const/var/srenorm/var.srenorm.arpege.tl499.01
/home/martinezs/pub/const/var/stabal96/var.stabal96.arpege.03.bal
/home/martinezs/pub/const/var/stabal96/var.stabal96.arpege.03.cv
/home/martinezs/pub/const/var/wavelet/var.wavelet.arpege.tl224.01.cv
/home/martinezs/pub/const/var/wavelet/var.wavelet.arpege.tl499.01.cv

* file “const.rome.txt”:

/home/martinezs/pub/const/atlas/seviri/atlas.seviri.02
/home/martinezs/pub/const/emissivity_atlas/seviri/emissivity_atlas.seviri.02
/home/martinezs/pub/const/pgd_franmg/01km30/pgd_franmg.01km30.05.fa
/home/martinezs/pub/const/var/misc/var.misc.bcor_meto_irsea.08
/home/martinezs/pub/const/var/stabal41/var.stabal41.franmg.02.bal
/home/martinezs/pub/const/var/stabal41/var.stabal41.franmg.02.cv

Appendix 3: list of -D parameters used for defining #ifdef directives in the codes.

MACROS_FRT = -DLINUX -DLITTLE_ENDIAN -DLITTLE -DADDRESS64 -DGRIB_API_1
MACROS_CC = -DLINUX -DLITTLE_ENDIAN -DLITTLE -DGRIB_API_1
MACROS_BL95 = -DLINUX -DLITTLE_ENDIAN -DLITTLE -DIS_MAIN_PROG -DSTATIC_LINKING
MACROS_ODB98 = -DLINUX -DLITTLE_ENDIAN -DLITTLE -DXPRIVATE=PRIVATE -UINTERCEPT_ALLOC -UUSE_ALLOCA_H

GMK_FCFLAGS_ARPIFS = -DINTEL_BUG_LAIDDIOBSAD -DINTEL_BUG_MPOBSEQ
GMK_FCFLAGS_ARP = -DINTEL_BUG_LAIDDIOBSAD -DINTEL_BUG_MPOBSEQ

GMK_FCFLAGS_SATRAD = -D_RTTOV_DO_DISTRIBCOEF
GMK_FCFLAGS_SAT = -D_RTTOV_DO_DISTRIBCOEF

GMK_FCFLAGS_SURFEX = -r8 -Din_surfex -DSFX_ARO -DSFX_ASC -DSFX_OL -DSFX_TXT -DSFX_FA -DSFX_LFI -DARO -DOL -DASC
-DTXT -DFA -DLFI
GMK_FCFLAGS_MSE = -r8
GMK_FCFLAGS_MPA = -r8

GMK_FCFLAGS_XRD = -DHIGHRES -DBLAS
GMK_FCFLAGS_IFSAUX = -DHIGHRES -DBLAS
GMK_FCFLAGS_XLA = -DBLAS
GMK_FCFLAGS_ALGOR = -DBLAS
GMK_CFLAGS_XRD = -DPOINTER_64
GMK_CFLAGS_IFSAUX = -DPOINTER_64
GMK_CFLAGS_ODB = -DSTATIC_LINKING -DXPRIVATE=PRIVATE -DINTERCEPT_ALLOC -DUSE_ALLOCA_H -DCANARI -DHAS_LAPACK
-DNO_CURSES
GMK_CFLAGS_BLA = -DSTATIC_LINKING -DXPRIVATE=PRIVATE -DINTERCEPT_ALLOC -DUSE_ALLOCA_H
GMK_CFLAGS_BLACKLIST = -DSTATIC_LINKING -DXPRIVATE=PRIVATE -DINTERCEPT_ALLOC -DUSE_ALLOCA_H