RESEARCH DEPARTMENT MEMORANDUM

To:	RD Scientific Staff and Consultants
Copy:	DR, DO, HMD, HMAS, HMOS, John Hodkinson, François Bouttier, Claude Fischer, Ryad El Khatib, Karim Yessad, John Hague
From:	Deborah Salmond et al.
Date:	July 3, 2013 File: RD13-126
Subject:	**IFS Memorandum Cycle CY39R1**

Cycle 39r1 was created in March-June 2013. This is based on the joint cycle CY39 and the CY38R2 Esuite branch. Active contributions have been marked **ACTIVE**. Contributions which are/are not Bit-reproducible with CY39 are marked **BR/Not-BR** respectively.

Contributors:

Anna Agusti-Panareda, Magdalena Alonso Balmaseda, Gianpaolo Balsamo, Fabrizio Baordo, Anton Beljaars, Peter Betchtold, Angela Benedetti, Jean Bidlot, Massimo Bonavita, Niels Bormann, Oyvind Breivik, Glenn Carver, Giovanna Di Chiara, Mohamed Dahoui, Michail Diamantakis, Rossana Dragani, Richard Engelen, Reima Eresmaa, Mike Fisher, Johannes Flemming, Richard Forbes, Anne Fouilloux, Alan Geer, John Hague, Sean Healy, Hans Hersbach, Elias Holm, Antje Inness, Marta Janiskova, Sarah Keeley, Patrick Laloyaux, Simon Lang, Martin Leutbecher, Sarah-Jane Lock, Philippe Lopez, Linus Magnusson, Sylvie Malardel, Sebastien Massart, Stephane Martinez, Kristian Mogensen, Jean-Jacques Morcrette, George Mozdzynski, Paul Poli, Gabor Radnoti, Michael Rennie, Patricia de Rosnay, Sami Saarinen, Deborah Salmond, Kirsti Salonen, Irina Sandu, Noureddine Semane, Tim Stockdale, David Tan, Enza Di Tomaso, Yannick Tremolet, Filip Vana, Frederic Vitart, Nils Wedi, Tomas Wilhelmsson, Karim Yessad

NUMERICAL ASPECTS

Michail Diamantakis - namd_CY39_massfixpack - PASSIVE/BR

Mass fixing schemes for semi-Lagrangian tracer advection

This is a package of global mass fixers for IFS. It includes improvements (OpenMP parallelization) to the previously released Bermejo & Conde scheme as well as two new algorithms:

- The well known quasi-monotone mass fixer by A. Priestley MWR 1993
- John Mac Gregor's mass fixer (originally developed for C-CAM climate model). This algorithm can be applied to any interpolation scheme, either low or high order, but does not guarantee monotonicity.

The available mass fixers are global, however, they compute larger corrections in regions where the error due to semi-Lagrangian advection is expected to be large and very small elsewhere.

Expts: control=ftz5, test(passive)=fu0h

Files created(IFS):

`control/jmgfixer.F90 negfixer.F90 qmfixer2.F90 trmfixers.F90`

Files modified(IFS):

```
adiab/call_sl.F90 laitre_gfl.F90 laitre_gmv.F90 lapineb.F90 larcinb.F90
control/gp_model.F90 qmfixer.F90 tracmf.F90
interpol/laminmaxint.F90
module/chem_mix.F90 yom_ygfl.F90 yomdyn.F90
namelist/namchem.h namdyn.h namgfl.h
setup/sudim1.F90 sudyn.F90 sugfl1.F90 sugfl2.F90 sugfl3.F90
```

Sylvie Malardel, Nils Wedi, George Mozdzynski, Karim Yessad - nas_SB38R2_svp - PASSIVE/BR

NH and shallow water model and miscellaneous bug fixes

Expts-T511 L137: control=fue0, test(passive)=fubs

Bug Fixes and Optimisation:

- lanhsi.F90 : bug fix for double counting of explicit part of Coriolis in case of LGWADV and no PC
- latte_bbc.F90: bug fix in case of non-SETTLS extrapolation (ELSE CASE)
- lapineb.F90: OpenMP bug setup up of pointers MGPGMV_xx and NGPGMV moved to new routine SETUP_GPGMV in gmv_subs_mod.F90 MGPGMV_xx setup removed from lapineb.F90, lapinebtl.F90,lapinebad.F90
- rrtm_setcoef_140gp.F90 Bug fix in case of last full level pressure smaller that smallest reference value in radiation tables (it may happen when LVERTFE=false)
- sualspa.F90: problem allocation array NGRBSP3
- create_wam_bathymetry.F: optimisation

- Shallow Water: gpmodel.F90: allocate arrays only of not LL2D, suhdf_ec.F90: setup some arrays to zero, suspecb.F90 : allocate and initialize orography
- sudyn.F90 : LSVTSM=.false. as default in any case

Files modified(IFS):
`adiab/lanhsi.F90 lapineb.F90 lapinebad.F90 lapinebtl.F90 latte_bbc.F90`
`control/gp_model.F90`
`module/gmv_subs_mod.F90`
`phys_radi/rrtm_setcoef_140gp.F90`
`setup/sudyn.F90 sudyna.F90 suhdf_ec.F90 suspecb.F90`
`utility/sualspa.F90`

Files modified(WAM):
`Wam_oper/create_wam_bathymetry.F`

PHYSICS

Peter Betchtold - pas_SB38R2_dcycle_vdiff_nocloudevap_albedo_splanet_for39r1 - ACTIVE

Merged physics contribution

Merged from: Peter Betchtold, Gianpaolo Balsamo, Richard Forbes, Irina Sandu, Anton Beljaars, Philippe Lopez, Noureddine Semane, Filip Vana, Jean-Jacques Morcrette, Marta Janiskova

Gianpaolo Balsamo - pad_SB38R2_snowalbedofix_only_neutral_retuning - ACTIVE

A bugfix for the spectral-band split of the albedo in the radiation (capping albedo to 1) and a retuning of the snow albedo in the land surface scheme (to obtain near-neutral impact of the fix).

Files modified(IFS):
`phys_ec/callparad.F90 callpartl.F90 sualb2si.F90 surfrad_ctl_mod.F90`

Files modified(SURF):
`module/surwn_mod.F90 sussoil_mod.F90`

Richard Forbes - pas_SB38R2_esuite_autoconvevap_non_active_clean - PASSIVE

- New rain evaporation parametrization based on Abel and Boutle (2013) (switched off)
- New warm rain autoconversion and accretion parametrization based on Khairoutdinov and Kogan (2000) (switched off) (switched off)
- New riming term for ice and snow (accretion of cloud water onto ice/snow particles) (switched off)
- Climplot modification to add CC, CLWC, CIWC difference plots from reference model

Files modified(IFS):
`modules/yoecldp.F90 phys_ec/cloudsc.F90 sucldp.F90`

Files modified(SCRIPTS):
`metview/zondia_seas_icon_batch.met`

Irina Sandu and Anton Beljaars - pa3_SB38R2_LT30_MLUK_BLHDIAG_clean2 - ACTIVE

- modified treatment of turbulent diffusion in stable conditions (implying a reduction of the diffusion), plus code cleaning including removing a non-resolved shear term entering the computation of the diffusion coefficients
- adjustment of the drag over orography and the low level blocking
- adjustment of the land-atmosphere coupling for high vegetation
- change in voskin.F90 so that the lowest model level winds are used instead of the 10m wind diagnostics
- modification of the PBL height diagnostic according to the findings of Seidel et al. 2012

Files modified(IFS):
`phys_ec/sugwd.F90 vdfdpbl.F90 vdfexcu.F90 vdftofdc.F90`

Files modified(SURF):
`module/surfpp_ctl_mod.F90 susveg_mod.F90 voskin_mod.F90`

Peter Bechtold - pae_SB38R2_dcyclemods_nonlinear_TLAD_dcyclewater_complete -ACTIVE

also contains pah_SB38R2_pbechtold_dcycle_land_sea

- Diurnal cycle extension of CAPE for land and water activated under switch RCAPDCYCL=2
- formulate CAPE in J/V instead of J/kg from which mass flux follows naturally

Also passive changes:

- reduced stratospheric diffusion
- reintroduction of RHEBC
- climplot bug correction, and different colour scale for diurnal cycle phase

Files modified(IFS):
`phys_ec/cumastrn.F90 sucumf.F90 cuflxn.F90 vdfouter.F90 vdfexcu.F90`
`namelist/namcumf.h module/yoecumf.F90`

Files modified(SCRIPTS):
`climplot/plot_amp_phase_clim.met climplot_batch`

Files deleted(IFS):
`phys_ec/cuinintl.F90 cuininad.F90 cudtdqntl.F90 cudtdqnad.F90`

Philippe Lopez - pah_SB38R2_pbechtold_dcycle_land_sea - ACTIVE

Corresponding TL/AD diurnal cycle modification for simplified convection scheme

Files modified(IFS):

`phys_ec/cumastrn2.F90 cumastrn2tl.F90 cumastrn2ad.F90 sucumf2.F90`
`namelist/namcumfs.h module/yoecumf2.F90`

Noureddine Semane - pans_CY38R2_SB38R2_ncloudevap - PASSIVE

Small Planet

Complete Small Planet scaling through factors RPLRADI, RCORIOI, RPLRG, RPLDARE, RHOUR, RHOURI

Introduction of rplrg in order to rescale the atmospheric height (gravity).

Files modified(IFS):

`external/surfexcdriver.F90 surfpp.F90 interface/surfexcdriver.h surfpp.h`
`module/sppcfl_mod.F90 sppgust_mod.F90 surfexcdriver_ctl_mod.F90`
`surfpp_ctl_mod.F90 susurf_ctl_mod.F90 suvexc_mod.F90 voskin_mod.F90`

Files modified(IFS):

`phys_ec/culight.F90 radlswr.F90 vdftofdc.F90 vdfvint.F90 lwu.F90`
`phys_radi/mcica_cld_gen.F90 suswn.F90 uvradi.F90`

LREASUR reset to true for LAQUA

Introduction of RPLDARE

Files modified(IFS):

`setup/su0phy.F90 sudyncore.F90 module/yomdyncore.F90 oops/ifs_constants.F90`
`namelist/namdyncore.h ifs/phys_ec/vdfmain.F90 vdfdpbl.F90 vdfexcu.F90`
`vdfhghtn.F90 cubasen.F90`

- The time step weighting in vertical diffusion discretization increased by a factor RPLDARE. This is not a rescaling of the implicit scheme configuration but it is only an indirect way to rescale the initial condition of the surface energy fluxes. Indeed, we still over-implicit by a factor of 1.5 but with an initial surface flux increased by a factor=rpldare.
- The surface buoyancy flux rescaled by a factor=RPLRG*RPLDARE The rescaling keeps the friction velocity invariant as well as the free convective scale.
- The exchange coefficients are rescaled by a factor=rpldare in vdfexcu.F90 The EDM flux (EDMF) is rescaled by a factor=rpldare in vdfhghtn.F90.

Files modified(IFS):

`phys_ec/cloudsc.F90 sucldp.F90 module/yoecldp.F90`

The factor 5.09E-3 (in the evaporation of clear-sky precipitation Kessler,1969) is added to yoecldp.F90/sucldp.F90.

Files modified(IFS):

`phys_ec/cuflxn.F90 /ucumf.F90 module/yoecumf.F90`

The factor 5.09E-3 in the evaporation of convective rain is added to yoecumf.F90/sucumf.F90.

Files modified(IFS):
`phys_ec/ecradfr.F90 phys_radi/suecrad.F90`

Replace 3600s/86400s by RHOUR/RDAY in order to have a correct radiation flux. The frequency of radiation computations should not be invariant (in the small planet) and hence must be rescaled consistently with the rescaled day (hour) length in order to obtain correct radiation fluxes.

Files modified(IFS):
`phys_ec/updtier.F90 utility/updtim.F90`

Replace RDAYI by RDAY as the day duration should not be invariant (in the small planet) and must be rescaled consistently to obrtain correct SW radiation fluxes.

Files modified(IFS):
`phys_ec/vdfdifh.F90 radheatn.F90`

The surface and radiation fluxes are rescaled by a factor rpldare.

Files modified(IFS):
`module/yomcst.F90 setup/sucst.F90 suhdf_ec.F90 phys_ec/sugwwms.F90 sugwd.F90 callpar.F90 cumastrn.F90 ecradfr.F90 sucumf.F90 phys_radi/suecrad.F90 utility/updtim.F90`

The duration of the solar hour is scaled by RCORIOI and fixed time=3600s is replaced by RHOUR

Files modified(IFS):
`setup/suhdf_ec.F90`

The truncation NSMAX (OR KMAX) is rescaled by RPLRADI as was already done in sucumf.F90 etc.

Files modified(IFS):
`setup/suhdir.F90`

For horizontal diffusion, the e-folding time is given as a function of the truncation (suhdir.F90) and diffusion coefficients must be scaled by the same scaling factor RPLRADI. Also scaling of graphical output

Files modified(SCRIPTS):
`metview/climate_obs.met climplot_batch marsretr_wavfreq.met mean_season_ens monmeans_clim.met monmeans_clim_batch wind_maps_clim.met check_periods.sms sms/climplot.sms mmeans_ml.sms mmeans_pl.sms mmeans_sfc.sms`

Philippe Lopez - pah_SB38R2_assim_SYNOP_raingauges - PASSIVE/BR

Rain Gauge Assimilation

Expts: control=ftny, test(passive)=fto8 and control=ftjq, test(active)=ftvs

Implementation of the direct 4D-Var assimilation of rain gauge observations from synoptic stations, which will not be activated by default (for the time being). The two switches in prepIFS to turn on/off rain gauge assimilation will be LRAINGG and LSYNOP_RG. Both switches will be set to ”off” by default.

Files created(IFS):
`module/yomraingg.F90`
`raingg/raingg_get.F90 raingg_get_ad.F90 raingg_get_tl.F90 raingg_obsop.F90`

raingg_obsop_ad.F90 raingg_obsop_tl.F90 raingg_put.F90 raingg_put_tl.F90
raingg_screen.F90 raingg_setup.F90

Files created(ODB):

bufr2odb/bufr2odb_rain_gauges.F90

ddl.CCMA/ecmwf_matchup_raingg.sql obsdist_hdr2raingg_body.sql obsdist_raingg.sql
obsdist_raingg_body.sql obsort_hdr2raingg_body.sql raingg.h raingg_body_rr.sql
raingg_rr.sql robhdr_raingg_get_rr.sql robhdr_raingg_put_rr.sql
robody_raingg_get_rr.sql robody_raingg_put_rr.sql

ddl.COUNTRYRSTRHBIAS/raingg.h

ddl.ECMA/ecmwf_matchup_raingg.sql links_raingg.sql matchup_raingg.sql
obsdist_hdr2raingg_body.sql obsdist_raingg.sql obsdist_raingg_body.sql
obsort_hdr2raingg_body.sql obsort_raingg.sql obsort_raingg_body.sql raingg.h
raingg_body_rr.sql raingg_rr.sql robhdr_raingg_get_rr.sql
robhdr_raingg_put_rr.sql robody_raingg_get_rr.sql robody_raingg_put_rr.sql
update_links_raingg.sql

ddl.RSTBIAS/raingg.h

ddl.SONDETYPERSTRHBIAS/raingg.h

ddl/ecmwf_matchup_raingg.sql links_raingg.sql matchup_raingg.sql
obsdist_hdr2raingg_body.sql obsdist_raingg.sql obsdist_raingg_body.sql
obsort_hdr2raingg_body.sql obsort_raingg.sql obsort_raingg_body.sql raingg.h
raingg_body_rr.sql raingg_rr.sql robhdr_raingg_get_rr.sql
robhdr_raingg_put_rr.sql robody_raingg_get_rr.sql robody_raingg_put_rr.sql
update_links_raingg.sql

interface/map_reportype.h

Files created(SATRAD):

programs/bufr_screen_synop_rain_gauges.F90 distance.F90

Files created(SCRIPTS):

gen/groupid=40.tables preraingg

sms_an/archive_synrg.sms b2o_synrg.sms convert_synrg.sms
obstat_archive_synrg.sms obstat_synrg.sms preraingg.sms

sms_era/obtime_synrg.sms

Files modified(IFS):

canari/caratk.F90

common/yomdb_defs.h yomdb_vars.h

control/gp_model.F90 gp_model_ad.F90 gp_model_tl.F90

module/pardimo.F90 yoephy.F90 yomcoctp.F90

namelist/naephy.h

obs_preproc/blackhat.F90 defrun.F90 suobs.F90

op_obs/hop.F90 hopad.F90 hoptl.F90

phys_ec/callpar.F90 callparad.F90 callpartl.F90 ec_phys.F90 ec_phys_ad.F90
ec_phys_drv.F90 ec_phys_drv_ad.F90 ec_phys_drv_tl.F90 ec_phys_tl.F90
ec_physg.F90

setup/cmoctmap.F90 cmoctmap_inv.F90 su0phy.F90

var/ecset.F90 ecset_thsafe.F90

Files modified(ODB):

bufr2odb/get_varindex.F90

cma2odb/ctxinitdb.F90 distributedb.F90 getatdb.F90 getdb.F90 init_odb_tables.F90

initmdb.F90 map_reportype.F90 matchupdb.F90 putatdb.F90 shuffledb.F90 xchangedatadb.F90 xchangedatadistdb.F90

ddl/black_robhdr_10.sql black_robody_10.sql body.h cma.h hdr.h obstype.h

include/bufr2odb.h

module/varindex_module.F90

scripts/create_ioassign

tools/Bufr2odb.F90

Files modified(SCRIPTS):

def/an.def fsobs.def

gen/archive_obsgroup bufr2odb convert_obsgroup create_ioassign fetchobs ifsmin ifstraj mkabs_satrad obstat obstat_init

sms/fc_sens_save.sms

sms_an/archive_obsgroup.sms convert_obsgroup.sms

sms_era/obtime.sms

Philippe Lopez - pah_SB38R2_LEKPERT_retuning - ACTIVE

LEKPERT

Expts: - control=ftjq, test=fu4j

Retuning of the regularization of upper-air and surface exchange coefficients in the tangent-linear and ajoint versions of the simplified vertical diffusion scheme. Re-activation of switch LEKPERT in the minimization. Also, removal of obsolete simplified convection routines. The impact on forecast scores is neutral. More details on this impact will be available in the Research Memorandum describing the issues related to the increase of vertical resolution in cycle 38r2.

Files modified(IFS):

phys_ec/vdfexcusad.F90 vdfexcustl.F90

Files modified(SCRIPTS):

gen/ifsmin

Files modified(SURF):

module/vexcssad_mod.F90 vexcsstl_mod.F90

Files deleted(IFS):

phys_ec/cudtdqnad.F90 cudtdqntl.F90 cuininad.F90 cuinintl.F90

Filip Vana - pafv_CY38R2_ltdiablin - BR

Rename GFL attribute LPHYLIN

The GFL attribute LPHYLIN is renamed LTDIABLIN (DIABabatic Tendencies interpolated by LINear interpolation)

Files deleted(IFS):

adiab/larcinb.F90 lattex.F90 module/gfl_subs_mod.F90 type_gfls.F90 setup/suctrl_gflattr.F90 sudefo_gflattr.F90 sugfl3.F90

Filip Vana, Jean-Jacques Morcrette, Alessio Bozzo - pafv_SB38R2_slhd - not-BR

New interface to ECMWF physics

Branches:

pafv_SB38R2_physint - new interface for IFS physics

pafv_SB38R2_minv - minv.F optimized and rewritten to F90

pafv_SB38R2_hdfix - fix of horizontal diffusion (spectral & gridpoint) setup

pam_CY38R1_Fix_Visib_02 - visibility computation

paab_CY36R4_newICE - extracts relevant to radiation scheme called from callpar

Expts: Climate frul - neutral, T511 4D-Var: control=ftjl, test=fun1

- New model to (IFS) physics interface - cleaning, bug fixing and extending functionality of the IFS physics. The code for separate parameterizations becomes more encapsulated, the dataflow is shared within all physics subspace. This gives more flexibility to be manipulated and extended. Some broken or unused options were cleaned out like physics computed on different grid from the model (NPHYINT $>$ 0) or various options to call physics in the ICI (P/C) scheme (NEPHYS_PCFULL /= 3).
- F77 wrapper for matrix manipulation from LAPACK package optimized for the use in IFS and rewritten to F90.
- Fix and cleaning of spectral and SLHD numerical diffusion for IFS.
  i/ The spectral diffusion for the top sponge layer made consistent with the settings below.
  ii/ Setup fairly flexible for all combinations of diffusion schemes in IFS.
- Computation of the visibility working now for both the operational and the MACC configurations.
- Present operational radiation scheme available from the CALLPAR (the main routine for IFS physics).

Files deleted(IFS):

```
phys_ec/sltend1.F90 sltend2.F90 ec_physg.F90
```

Files deleted(ALGOR):

```
external/linalg/minv.F
```

Files created(IFS):

```
module/yomctesseldim.F90 yomphyder.F90 phys_ec/aer_cloud_layer.F90
aer_phy3_layer.F90 aerdiag_layer.F90 aerini_layer.F90 backscatter_layer.F90
claervis.F90 clddia_layer.F90 cldprg_layer.F90 climaer_layer.F90 cloud_layer.F90
cloud_s_layer.F90 cond_layer.F90 convection_ca_layer.F90 convection_layer.F90
convection_s_layer.F90 ductdia_layer.F90 grg_tend_layer.F90 gwdrag_layer.F90
gwdragwms_layer.F90 gwdragwms_s_layer.F90 lightning_layer.F90
local_arrays_ini.F90 local_state_ini.F90 nocloud.F90 noconvection.F90
nogwdrag.F90 noradiation.F90 nosurftstp.F90 noturbulence.F90 phys_arrays_ini.F90
phys_dim_ini.F90 postphy_layer.F90 radflux_layer.F90 radiation_layer.F90
radvis_layer.F90 sltend_layer.F90 stochpert_layer.F90 store_traj_phys_layer.F90
surfbc_layer.F90 surfrad_layer.F90 surftstp_layer.F90 turbulence_layer.F90
turbulence_s_layer.F90 update_state.F90 uvradi_layer.F90
```

Files created(ALGOR):

`external/linalg/minv.F90`

Files modified(IFS):

`adiab/cpg.F90 gpino3ch.F90 chem/chem_main.F90 control/gp_model.F90 gp_model_tl.F90 module/stoph_mix.F90 yoe_cuconvca.F90 yoe_tile_prop.F90 yoephy.F90 yomlcz.F90 yomradf.F90 namelist/naephy.h phys_ec/aer_phy2.F90 aer_phy3.F90 aer_wind.F90 aero_init.F90 ca_profpert.F90 callpar.F90 callparad.F90 callpartl.F90 cloudsc.F90 cloudst.F90 cloudstad.F90 cloudsttl.F90 cond.F90 condad.F90 condtl.F90 cucalln.F90 cucalln2.F90 cucalln2ad.F90 cucalln2tl.F90 diag_dcycle.F90 ec_phys.F90 ec_phys_drv.F90 methox.F90 o3chem.F90 phys_ad.F90 phys_nl.F90 phys_tl.F90 qnegat.F90 radheatn.F90 radina.F90 radvis.F90 sltend.F90 spbsgpupd.F90 update_fields.F90 vdfmains.F90 vdfmainsad.F90 vdfmainstl.F90 vdfouter.F90 phys_radi/suecrad.F90 uvradi.F90 setup/su0phy.F90 sudyn.F90 sudyn_setgflattr.F90 sugfl.F90 suhdf_ec.F90 suhdir.F90 susavtend.F90`

Files modified(SURF):

`external/surftstp.F90 offline/module/yoephy.F90`

DATA ASSIMILATION

Elias Holm and Massimo Bonavita - dae_SB38R2_EDA_JB_CALC_PLUS - ACTIVE

EDA online calculation of background error covariance matrices

Expts: Extensive!

The EDA has been changed so that it now calculates both errors and online covariances B for each cycle for LEDA_ERRORS_OUT=ON. The covariance is calculated from the last couple of weeks of states (spin-up depending on the number of EDA members). The states are retrieved at their original resolution and representation (LEDA_READ_AV=ON) and interpolated and interpolated/spectrally truncated when read into the covariance calculation in sujbwavgen.F90. Two parameters have been changed for the wavelet B. First,WJBCONFof the wavelet B files. Second, CONFIGthe default value to go together with the CY39R1 B. Additionally the interface to jbchvar.F90 (and its inverse/adjoint) has been made explicit so that it can be used in different parts of the code, in particular sujbwavgen.F90. Normal 4D-VAR experiments that specify an EDAEXPVER that has calculated on-line B (which would be the default case for 0001) will pick up both the variances and correlation matrices of the day.

Files modified(IFS):

`module/iostream_mix.F90 yomwavelet.F90 obs_preproc/gefger.F90 utility/grid_biconserv.F90 gstats_label_ifs.F90 var/cvar3.F90 cvar3ad.F90 cvar3in.F90 cvar3inad.F90 jbchvar.F90 jbchvarad.F90 jbchvari.F90 jbchvariad.F90 pregprh.F90 sujb.F90 sujbwavelet.F90 sujbwavgen.F90 sujbwavwri.F90 troplev.F90`

Files modified(PREPDATA):

`programs/sqrt.F90`

Files modified(SCRIPTS):

`def/an.def gen/eda_err_save ens_errors ens_fetch_fields fetch_jb_fields_mem fetchmars ifsmin ifsvar lowres_fp odb2odb1 pre_fetch_jb_grid pre_fetch_jb_spectral varconsts sms_an/4dvar.sms anpl.sms clean_an.sms`

Mike Fisher - dai_SB39_OOPS_for_next_cycle - BR

Refactoring for OOPS

The part of the CONTROL_VECTOR correpsonding to the inital state has been separated off into a new derived type: JB_CONTROL_VECTOR. This allows the Jb code to deal exclusively with JB_CONTROL_VECTORs, without having to carry around parts of the full control vector that are not involved in Jb. JB_CONTROL_-VECTORS have a similar interface to CONTROL_VECTORS (e.g. they can be allocated/deallocated in a similar way).

Global variables in control_vectors_data_mix.F90 have been moved into a derived type (CONTROL_VECTOR_-DATA_STRUCT) to allow multiple resolutions of control vector to co-exist.

All global variables in YOMCVA have been moved into derived types. This is necessary to allow multiple instances of Jb to co-exist. Three new derived types have been introduced: CVA_STRUCT_TYPE holds the global control vectors YVAZX, YVAZG and YVAZ0; SCALP_STRUCT_TYPE holds the scalar product vectors YSCALP, YRSCALP, YSCALPSQRT and YRSCALPSQRT; and CVA_DATA_TYPE contains dimensioning information (NVA3D, etc).

Four new global pointers have been introduced, corresponding to the above derived types: CTLVEC_STRUCT, CVA_STRUCT, CVA_DATA and SCALP_STRUCT. It is hoped that these globals will be phased out in the future.

Files created(ALGOR):

`module/jb_control_vectors_base_mod.F90 jb_control_vectors_mod.F90 jb_control_vectors_-oper_mod.F90 jb_control_vectors_para_mod.F90`

Files modified(ALGOR):

`module/control_vectors.F90 control_vectors_base_mix.F90 control_vectors_data_mix.F90 control_vectors_oper_mod.F90 control_vectors_para_mod.F90`

Files modified(IFS):

`ald_inc/interface/etransdir_jb.intfb.h interface/etransdir_jbad.intfb.h interface/etransinv_jb.intfb.h interface/etransinv_jbad.intfb.h`
`control/adjotest.F90 cdsta.F90 cfcsens2obs.F90 cgr1.F90 cva2.F90 forecast_error.F90 sim4d.F90 tesadj.F90 testli.F90 testlievol.F90`
`module/control_vectors_comm_mod.F90 yomcva.F90`
`oops/allobs_mod.F90 error_covariance_3d_mod.F90`
`parallel/dot_product_ctlvec.F90`
`setup/su0yomb.F90 su1yom.F90`
`sinvect/balanced_reduction.F90 chnorm.F90 chsymeig.F90 cun3.F90 eof_matrix.F90 jacdav.F90 lcztoald.F90 lcztoifs.F90 nalan1.F90 nalan2.F90 opk.F90 opm.F90 rdtllcz.F90 scaas.F90 sptrlcz.F90 su_subspace.F90 sulcz.F90 wrtllcz.F90`
`transform/transdir_wavelet.F90 transdir_waveletad.F90 transinv_mdl.F90 transinv_wavelet.F90 transinv_waveletad.F90`
`utility/add5to3.F90 addfgs.F90 dealctv.F90 freemem.F90 prt_conv_diags.F90 prt_ctlvec_max.F90 prt_ctlvec_norms.F90 random_ctlvec.F90 save_evecs.F90 save_test4dinc.F90 sbs5to3.F90 setimzero.F90 sualspajb.F90 write_ctlvec_grib.F90 write_wavelet_initcv_grib.F90`
`var/adtest.F90 balvert.F90 balvertad.F90 balverti.F90 balvertiad.F90 bgevecs.F90 bgvecs.F90 cain.F90 cainad.F90 cainin.F90 caininad.F90 congrad.F90 congrad_ad.F90 ctcab.F90 ctonb.F90`

cvar2.F90 cvar2ad.F90 cvar2in.F90 cvar2inad.F90 cvar3.F90 cvar3ad.F90 cvar3in.F90 cvar3inad.F90 cvargpad.F90 cvargptl.F90 cvtest.F90 djbdy.F90 djcdy.F90 evcost.F90 jbvcoord_interpolate.F90 jbvcoord_interpolate_ad.F90 jbvcor_wavelet.F90 jbvcor_waveletad.F90 jbvcor_waveletin.F90 jbvcor_waveletinad.F90 jbvcorg.F90 jgcor.F90 jgcorad.F90 jgcori.F90 jgcoriad.F90 jgnr.F90 jgnrad.F90 jgnri.F90 jgnriad.F90 litest.F90 preppcm.F90 sqrtb.F90 sqrtbad.F90 sqrtbin.F90 sqrtbinad.F90 sualctv.F90 sualges.F90 sujb.F90 sujbcov.F90 sujbtest.F90 sujbwavgen.F90 sujbwavvc.F90 sumoderr.F90 supert.F90 suscal.F90 suvazx.F90 tlprop.F90 tltest.F90 vec2gpfe.F90 wavxform.F90 xformev.F90

Files modified(PREPDATA):

programs/unbal_eda.F90

Gabor Radnoti - dag_SB38R2_lwda_v3 - BR

Long-Window 4D-Var

Patricia de Rosnay and Gabor Radnoti - dap_SB38R2_blacklist_snow - BR

Improvement in the snow blacklist: generic approach to get the most recent input file for a given cycle

Expts:

- fuhj (test using dap_SB38R2_blacklist_snow) and fuhk (control using das_CY38R2_esuite) are bit identical for two 4D-Var cycles tested on 2013020100-2013020112 (spectral and gridpoint norms are identical up to the last digit in the experiment and in the control). They both use the old empty snow blacklist file. The new branch uses the generic script to retrieve the appropriate blacklist file.
- fuhl (test using dap_SB38R2_blacklist_snow) and fuhm (control using das_CY38R2_esuite) are bit identical for two 4D-Var cycles tested on 2013022500-2013022512. They use the blacklist file blacklist_snow_2013021900 which is the most recent file for the running date.
- fuhn (test using dap_SB38R2_blacklist_snow) and fuho (control using dag_CY38R2_esuite) are bit identical for two 4D-Var cycles tested on 2013022600-2013022612. They use the blacklist file blacklist_snow_2013022600 which is the most recent file for the running date. For this recent date I used dag_CY38R2_esuite as a control since it contains the latest update in ssaana for the snow blacklist use (one more if to account for the snow blacklist change in operation done on 26 February).
- An early delivery test was also conducted with fuhw (test using dap_SB38R2_blacklist_snow) and fuig (control using dag_CY38R2_esuite). They are bit identical for two 4D-Var cycles tested on 2013022600-2013022612, as well as for the early delivery 4D-Var cycle.

Use a new script (get_nearest_infile_date) to pick up the nearest and most recent file for a given basetime, for a generic prefix and for cycle dependant path. The script uses three arguments to define the file to get: basetime, prefix and path. It is called from the surface analysis script (ssaana) for each time slot to pick up blacklist_snow from the blacklist path. The sub-branch also includes a minor modification in the soilana script to fix a grib_set command attributes for the sea ice temperature field.

The series of tests shows that the call of get_nearest_infile_date from ssaana gets the correct snow blacklist file and effectively replaces the list of 'if' that we temporarily put in 38r1/r2 to blacklist snow stations. It also shows that the grib_set fix in soilana is bit identical.

Files modified(SCRIPTS):

`sms_an/ssaana.sms gen/ssaana soilana`

Files created(SCRIPTS):

`gen/get_nearest_infile_date`

SATELLITE

Satellite Section - das_SB38R2_merge_sat

Merged from: Alan Geer, Sean Healy, Niels Bormann, Reima Eresmaa, Kirsti Salonen, Rossana Dragani, Fabrizio Baordo, Enza Di Tomaso

Alan Geer - stg_SB38r2_allsky_merge

Alan Geer - stg_SB38r2_dda_183 - ACTIVE

All-sky microwave: SSMIS 183 GHz channels activated; discrete dipole snow scattering

Expts: controls=standard T511 Winter and Summer, Winter test=ftyh, Summer test=ftyp

Assimilation of higher microwave frequencies has until now been limited by the difficulty of modelling the scattering radiative transfer of atmospheric snow. The optical properties of snow have been improved by using the discrete dipole approximation. This makes the observation operator much more accurate, particularly in deep-convective situations. This has allowed two extensions to all-sky observation usage over ocean surfaces:

- The higher-frequency microwave imager channels can now be used in deep convective areas.
- The SSMIS 183 GHz water vapour sounding channels have been activated for the first time.

These modifications improve dynamical forecast scores, improve the fit to wind observations in the FG, and reduce the size of the wind increments. The mechanism for the wind improvements is the 4D-var tracing effect, with the greatest benefit coming from cloud-affected water-vapour sounding observations in the midlatitude storm tracks.

Files created(IFS):

`mwave/mwave_flux_to_mmr.F90`

Files created(SATRAD):

`rttov/mw_scatt/rttov_distribute_hydro.F90 mw_scatt/rttov_hydro.F90 mw_scatt/rttov_hydro_ad.F90 mw_scatt/rttov_hydro_tl.F90`

Files modified(IFS):

`module/yommwave.F90`

mwave/mwave_cpfrac.F90 mwave_emis.F90 mwave_obsop.F90 mwave_obsop_ad.F90
mwave_obsop_tl.F90 mwave_obsop_traj.F90 mwave_setup.F90

namelist/nammwave.h

op_obs/cobs.F90

Files modified(SATRAD):

module/rttov_types.F90

mwave/mwave_emis_rttov.F90 mwave_obsop_rttov.F90 mwave_obsop_rttov_ad.F90
mwave_obsop_rttov_adtest.F90 mwave_obsop_rttov_tl.F90

programs/bufr_screen_tmi_1d.F90 rttovscatt_test.F90

rttov/mw_scatt/rttov_alloc_scatt_prof.F90 mw_scatt/rttov_boundaryconditions.F90 mw_-
scatt/rttov_boundaryconditions_ad.F90 mw_scatt/rttov_boundaryconditions_tl.F90 mw_-
scatt/rttov_dealloc_scattcoeffs.F90 mw_scatt/rttov_eddington.F90 mw_scatt/rttov_-
eddington_ad.F90 mw_scatt/rttov_eddington_tl.F90 mw_scatt/rttov_iniedd.F90 mw_scatt/rttov_-
iniedd_ad.F90 mw_scatt/rttov_iniedd_tl.F90 mw_scatt/rttov_iniscatt.F90 mw_scatt/rttov_-
iniscatt_ad.F90 mw_scatt/rttov_iniscatt_tl.F90 mw_scatt/rttov_integratesource.F90
mw_scatt/rttov_integratesource_ad.F90 mw_scatt/rttov_integratesource_tl.F90 mw_scatt/rttov_-
mieproc.F90 mw_scatt/rttov_mieproc_ad.F90 mw_scatt/rttov_mieproc_tl.F90 mw_scatt/rttov_-
read_scattcoeffs.F90 mw_scatt/rttov_scatt.F90 mw_scatt/rttov_scatt_ad.F90 mw_scatt/rttov_-
scatt_tl.F90 mw_scatt/rttovscatt_test_one.F90

Files modified(SCRIPTS):

gen/ifsmin ifstraj mklinks

Fabrizio Baordo - stfb_SB38r2_ssmis_land_passive - PASSIVE

SSMIS passive over land

Expts:

- Technical changes testing (SSMIS observations over land NOT available) (T511 L137) fukb (test) VS ftjq (control) – IDENTICAL RESULTS
- Passive changes testing (SSMIS observations over land available in the screening trajectory only) (T511 L137) fukc (test) VS ftjq (control) – IMPACT OF PASSIVE SSMIS OBSERVATIONS OVER LAND INTO THE SYSTEM

The branch includes the possibility of monitoring SSMIS observations over land. Emissivity retrieval over land has been implemented within rttov_scatt and it can be switched on passing observed brightness temperatures as optional input. The branch also includes the storage in the ODB of rttov input/output emissivities for every satellite observation available in the all-sky path and SSMIS retrieved emissivities over land.

Files modified(IFS):

module/parmwave.F90 yommwave.F90

mwave/mwave_diags.F90 mwave_emis.F90 mwave_get.F90 mwave_get_ad.F90
mwave_get_tl.F90 mwave_obsop.F90 mwave_obsop_ad.F90 mwave_obsop_test.F90
mwave_obsop_tl.F90 mwave_obsop_traj.F90 mwave_put.F90 mwave_screen.F90
mwave_setup.F90

obs_preproc/gefger.F90

Files modified(ODB):

`ddl/satbody_allsky.sql sufger_robhdr_1.sql`

Files modified(SATRAD):

`mwave/mwave_emis_rttov.F90 mwave_obsop_rttov.F90`
`onedvar/onedvar_obsop_grad_rttov.F90 onedvar_obsop_rttov.F90`
`programs/bufr_screen_ssmis_1d.F90 example_rttovscatt.F90`
`rttov/mw_scatt/rttov_eddington.F90 mw_scatt/rttov_scatt.F90 mw_scatt/rttovscatt_-test_one.F90`

Files modified(SCRIPTS):

`gen/premwimg`

Sean Healy - sti_SB38R2_for_39r1 - ACTIVE

Revision of GPS-RO bending angle intregral computation

Expts:

- ftt6, 38R2, T511, 91 levels vs. control ftt8 (das_CY38R2_esuite). 20121201 - 20130224.
- fu74 T511, 137 levels against ftjl
- fug5 T511, 137 levels against ftjq

The assumed variation of refractivity between model levels has been modified above 10 km. It is now consistent with a linear variation of temperature with height. This reduces some forward model biases, first noticed at the Met Office.

Files modified(IFS):

`module/yomlimb.F90`
`op_obs/gpscalc_alpha.F90 gpscalc_alphaad.F90 gpscalc_alphatl.F90 gpsro_ad.F90 gpsro_op.F90 gpsro_tl.F90`

Niels Bormann, Enza Di Tomaso and Massimo Bonavita - str_SB38R2_for_39R1 - ACTIVE

Expts:

- Enhanced use of AMSU-A/MHS surface-sensitive channels over sea-ice
  stt_SB38R2_for_39r1, ftwu, ftww
- Use of calibrated EDA-spread in radiance space for FG-check for ATOVS and related data
  str_SB38R2_EdaRad, ftss, ftsr)
- Quality control for lunar intrusions for ATMS
  str_SB38R2_AtmsQCflags, fudi vs fudh - T255 only
- Move of cloud detection for AMSU-A/B/MHS/MWTS/MWHS from blacklist to IFS-code for dedicated flagging

- Treat NOAA-18 MHS as MHS, not as AMSU-B
  last two combined: str_SB38R2_MWscreenLwpCorrect_N18MHS, ftmy, ftmz

Enza Di Tomaso: Activation of dynamic emissivities over sea ice for AMSU-A and MHS

For MHS, a specific quality control channel is set over sea ice to remove rain/cloud contamination. The emissivities for the MHS quality control channel are corrected for emissivity changes with frequency over sea ice.

A tighter rejection is performed for MHS and AMSU-A observations with not sensible retrieved values of emissivities.

The land/sea/sea ice discrimination is made more uniform across the code.

Niels Bormann and Massimo Bonavita: Use of calibrated EDA spread in radiance space as background error estimate for the FG-check for ATOVS

The changes calculate and use calibrated and spatially filtered versions of the EDA spread ("SES" fields) in radiance space as background error estimates in the FG-check for ATOVS and some related radiances, replacing the currently used "EF" fields. The calibration is done on the basis of observation departures rather than through verification against analyses. The new program eda_rad_coefs.F90 calculates the calibration coefficients, and eda_rad_scale.F90 applies the calibration to the raw EDA-spread fields. Spectral_Filter.F90 has been modified to handle brightness temperatures. Routines gefger.F90 and inifger.F90 have been modified so that the fields used as background error estimates can have a different spatial resolution than the EDA-spread fields also used here (needed for the EDA, where the former are still EF fields).

The changes allow us to disable bgobs and hence be more flexible with the number of iterations used in the first trajectory, potentially saving considerable computing time.

In addition, the FG-check and VarQC parameters for ATOVS data have been relaxed, and the observation error for AMSU-A channel 10 changed to 0.24 K.

The script changes activate the calculation of the SES fields, and they are designed to deal with two scenarios: The normal case is that the SES fields are calculated and archived in the EDA experiment, and subsequently used in a deterministic 4DVAR experiment that uses the EDA. If the EDA used for the deterministic experiment does not have the SES fields for radiances, these are instead calculated in fetcherr.

Niels Bormann: Revised cloud-flagging for AMSU-A/B/MHS/ATMS/MWTS/MWHS; lunar intrusion flagging for ATMS; NOAA-18 MHS as MHS

The flagging of cloud/rain-contaminated data for AMSU-A/B/MHS/ATMS/MWTS/MWHS has been moved inside the main IFS, to bring it in line with the way other cloud-flagging is done, and to combine cloud-screening decisions previously done in various places in one routine (mw_clearsky_screen.F90). Cloudy/rainy data are now flagged with datum_status.contam_cld_flag. The change means that it is easier to produce statistics for "clear" data, e.g., in obstat. The approach to identifying clouds has not been modified, but a bug was fixed for the calculation of the liquid water path for AMSU-A.

Flagging of lunar intrusions for ATMS has been added in mw_clearsky_screen.F90 (set flag datum_status.bad_practice), relying on the channel_qc flag provided in the BUFR data (and averaged up in create_averaged_values.F90). This has been correctly encoded at NDE only after 12 February 2013, but the flagging is still beneficial for earlier data (though not reliable for all channels).

The NOAA-18 MHS is now treated as an MHS instrument - it was previously re-labelled AMSUB for historical reasons. This means VarBC-coefficients will be cold-started for this instrument, but the change has otherwise no effect on the treatment of the instrument.

Files created(IFS):

`op_obs/mw_clearsky_screen.F90`

Files created(SATRAD):

`module/eda_rad_aux.F90`

`programs/eda_rad_coefs.F90 eda_rad_scale.F90`

Files created(SCRIPTS):

`gen/eda_rad_req.txt ens_cal_rad ens_errors_rad`

`sms_an/ens_cal_rad.sms ens_errors_rad.sms`

Files modified(IFS):

`module/yomemis.F90 yomfger.F90 yomnmev.F90`

`obs_preproc/black.F90 defrun.F90 gefger.F90 inifger.F90`

`op_obs/hop.F90 hretr.F90`

`setup/su_events.F90 suemis_conf.F90`

Files modified(ODB):

`cma2odb/create_averaged_values.F90`

`ddl/emiskf_amsua.sql emiskf_amsub.sql emiskf_mhs.sql radiance_averaging.sql sat_-atovs.sql satbody_atovs.sql sathdr_screen_atovs.sql type_definitions.h`

Files modified(PREPDATA):

`programs/Spectral_Filter.F90 sqrt.F90`

Files modified(SATRAD): `calc_radiance_fields.F90 emiskf_update_amsua.F90 emiskf_update_-amsub.F90 emiskf_update_mhs.F90 screen_1c.F90`

Files modified(SCRIPTS):

`def/an.def`

`gen/biassave convert_obsgroup eda_err_save ens_stats_mem fetcherr fetchmars getgrbe ifstraj mkabs_satrad mklinks`

`sms_an/fetcherr.sms`

Files deleted(IFS):

`op_obs/mw_screen_cloud_and_rain.F90`

Kirsti Salonen and Niels Bormann - sts_SB38R2_revised_AMV_usage_v2 - ACTIVE

Improving the use of AMVs in the system: situation dependent observation errors and revised quality control

Expts:

- fu96, fu97 T511/L137: testing the branch, control experiments ftjq and ftjl.
- funs, T511/L137: to test that the right error file is retrieved at every cycle.
- fsxx, fr80: testing with CY38R1, T511,L91, 1.1-29.2-2012 and 21.6-20.8.2012, control experiments fsxx and fpfs, respectively.

This branch activates the calculation and use of the situation dependent observation errors for AMVs. The observation error is divided into two parts: error due to error in the height assignment and error due to the tracking error. Tracking and height error estimates are read from an auxiliary file amv_p_and_tracking_error. A new script gen/get_nearest_infile_date has been introduced to retrieve the correct date dependent error file. Scripts gen/varconsts and sms/4dvar.sms have been modified to call the script get_nearest_infile_date. If a predefined estimate is not provided in the file, default values of 2.5 m/s for the tracking error and 80 hPa for the height error, defined in AMV_OBERROR, are used.

Introduction of the new observation errors enables revision of the first guess check for AMVs. The revised check in FGWND is symmetric and the rejection limits defined in DEFRUN have no geographical dependencies. The revised first guess check takes into account that the observation error for the u and v wind components may not be the same.

A new quality control criterion for AMVs is introduced in AMV_OBERROR. If the wind error due to error in height is greater than four times the tracking error that AMV observation is rejected.

Files created(SCRIPTS):

`gen/get_nearest_infile_date`

Files modified(IFS):

`obs_preproc/defrun.F90 fgwnd.F90`

`op_obs/amv_oberr.F90`

Files modified(SCRIPTS):

`gen/mklinks varconsts`

`sms_an/4dvar.sms`

Reima Eresmaa - ste_SB38R2_ovc_revised_and_imager_assisted_added - ACTIVE

Imager-assisted cloud detection for IASI radiance data

Expts: control=ftjl,ftjq, test=ftzl,ftzp

Presence of cloud in the IASI FOV is diagnosed on the basis of statistical properties within collocated AVHRR pixels. If cloud is found, contaminated channels are identified, just as in the earlier implementations of the cloud detection. The use of collocated AVHRR data is designed to act as an additional safety check aiming to find cloudy FOV's that otherwise would be flagged clear.

The modifications are found to decrease count of active IASI data, most notably (by up to 30%) on long-wave window channels. Additionally, there is a warming effect in lower troposphere, which is the strongest (a few tenths of a Kelvin) over Arctic sea ice in the winter experiment, and a slight reduction in tropical humidity and stratospheric ozone concentration. Forecast scores show mainly a modest positive impact on lower-tropospheric temperature and geopotential in winter hemispheres of the two runs.

The following files are modified:

Files modified(IFS):

`common/yomdb_defs.h yomdb_vars.h module/yomclddet.F90 yomsats.F90`
`namelist/namclddet.h obs_preproc/cloud_detect_setup.F90 op_obs/cf_digital.F90`
`cloud_detect.F90 hretr.F90 var/surad.F90`

Files modified(ODB):

bufr2odb/bufr2odb_cris.F90 bufr2odb_iasi.F90 get_varindex.F90
cma2odb/initmdb.F90 ddl/collocated_imager_information.h sathdr_screen_atovs.sql
module/varindex_module.F90

Files modified(SCRIPTS):
gen/mklinks

Files created(IFS):
op_obs/imager_cloud_detect.F90

Rossana Dragani - st3_SB38R2_new_o3_instr - PASSIVE

Implementation of new ozone sensors

Expts:

Sat	Sensor	Exp	Period
MetOp-B	GOME-2	ftz3	12Z 10-13/02/2013
NPP	OMPS (TCO)	fup3	12Z 17/10/2012
NPP	OMPS (Prof)	fuq8	12Z 01/11/2012

Implementation of new ozone data from MetOp-B GOME-2 (TCO) and NPP OMPS (TCO and nadir profiles).

Files created(ODB):
interface/map_reportype.h

Files modified(IFS):
module/varbc_to3.F90
var/surad.F90

Files modified(OBSTAT):
data/bufrodbcodes.cfg general.cfg stat.ref stat.ref.DCDA

Files modified(ODB):
bufr2odb/bufr2odb_reo3.F90
cma2odb/map_reportype.F90

Files modified(SATRAD):
programs/reo3_prescreen.F90

Files modified(SCRIPTS):
gen/prereo3

Alan Geer - stg_SB38R2_overcast_bugs - Not-BR

Overcast bug-fix

Expts:

- fuei - starting 1/6/2012 and equivalent to Gabor's summer control ftjq
- fuen - starting on 15/7/2012 using the initial conditions that trigger the bug. This experiment should still be compared to ftjq.

The branch contains two changes:

1. A bugfix for AIRS overcast observations, which were previously being assimilated incorrectly. This fix increases the number of overcast AIRS observations used in each cycle from about 2 to about 100, similar to IASI.
2. A fix for the issue encountered with AIRS overcast data in the 38r2 testing, which occurred when observations were identified as ocean in the hi-res trajectory but as high-altitude land in the low-res minimisation.

A total of 75 days were used in the statistics. There were negligible changes to obstat fits, except for AIRS itself. There were no significant forecast score changes.

Files modified(IFS):
`module/sats_mix.F90`
`namelist/namsats.nam.h`
`op_obs/cloud_estimate.F90 hradp.F90 hradp_ml.F90 hradp_ml_tl.F90 hradptl.F90 radtr.F90 radtr_ml.F90 radtr_ml_ad.F90 radtr_ml_tl.F90 radtrad.F90 radtrtl.F90`

MACC

Richard Engelen - stj_SB38R2_MACC_for_39R1 - BR

Merged from: Richard Engelen, Antje Inness, Johannes Flemming, Angela Benedetti, Jean-Jacques Morcrette, Anna Agusti-Panareda, Sebastien Massart

std_SB38R2for_39r1, stj_SB38R2_JJM, stj_SB38R2_JJM2, dism_SB38R2_MACC_GHG, paz_SB38R2_AER_lidar_for_c2a, paz_SB38R2_AOD_VARBC_for_c2a

MACC-II contribution to CY39R1

Expts: control=fuh8, test(passive)=fuh9, test(MACC NRT)=fuql

This contribution includes the following:

- Aerosols: post-processing of Aerosol Optical Depth and PM1, PM2.5, and PM10. Updates to the Calipso lidar observation operator. Updates to the MODIS AOD VarBC, including a new predictor.
- Greenhouse gases: Observation operators for GOSAT CO2 and CH4 retrievals. Coupling to CTESSEL.
- Reactive gases: various updates to C-IFS. Inclusion of C-IFS in data assimilation through the use if YCHEM GFL fields. Changes to allow fast-response experiments in case of volcanic eruptions.

Files created(IFS):

chem/cod_op_tm5.F90 tm5_aerosol_info.F90 tm5_directflux.F90 tm5_photo_flux.F90
tm5_photorates_tropo.F90 tm5_pifm_ran.F90 tm5_slingo.F90

module/tm5_photolysis_new.F90 yomvolcano.F90

namelist/namvolcano.h

op_obs/acos_ak_ad.F90 acos_ak_op.F90 acos_ak_tl.F90

phys_ec/liftemis.F90

setup/sujbvolc.F90 suvolc.F90

Files created(PREPDATA):

programs/vert_interpol.F90

Files created(SCRIPTS):

era/ainc_dexp_ContPlot.py ainc_dexp_PlotUtil.py ainc_dexp_calc.py ainc_dexp_plot.py

Files modified(IFS):

chem/chem_decay.F90 chem_init.F90 chem_main.F90 chem_massdia.F90 chem_noxadv.F90
chem_tm5.F90 tm5_budg.F90 tm5_calrates.F90 tm5_chem_ini.F90 tm5_do_ebi.F90
tm5_incbud.F90 tm5_reacbud.F90

climate/updclie_co2.F90

common/yomdb_defs.h

control/cdsta.F90 cnt4.F90

fullpos/hpos.F90

module/gfl_subs_mod.F90 gom_mod.F90 pardimo.F90 parfpos.F90
surface_fields_mix.F90 tm5_chem_module.F90 traj_physics_mod.F90
type_gems_profiles.F90 varbc_pred.F90 varbc_to3.F90 yoephy.F90
yom_grib_codes.F90 yom_ygfl.F90 yomafn.F90 yomaneb.F90 yomcosjo.F90 yomgrib.F90
yomppc.F90 yomsats.F90

namelist/naephy.h namafn.h

obs_preproc/defrun.F90 fgchk.F90 first.F90 pre_prsta.F90 reo3sin.F90 sugoms.F90

op_obs/aer_lidsimad.F90 aer_lidsimop.F90 aer_lidsimtl.F90 bgobs.F90 cobs.F90
cobsad.F90 ghg_ak_ad.F90 ghg_ak_op.F90 ghg_ak_tl.F90 grg_ak_ad.F90 grg_ak_op.F90
grg_ak_tl.F90 hdepart.F90 hop.F90 hopad.F90 hoptl.F90 hradp_ml.F90
hradp_ml_ad.F90 hradp_ml_tl.F90 hretr.F90 hvnmtlt.F90 mopitt_ak_ad.F90
mopitt_ak_op.F90 mopitt_ak_tl.F90 preint.F90 preintad.F90 preinttl.F90
radtr_ml.F90 radtr_ml_ad.F90 radtr_ml_tl.F90

phys_ec/aer_bdgtmss.F90 aer_phy1.F90 aer_phy3.F90 callpar.F90 callparad.F90
callpartl.F90 ec_phys.F90 gems_init.F90 gems_init_ad.F90 gems_init_tl.F90
gems_tend.F90 gems_tend_ad.F90 gems_tend_tl.F90 radaca.F90 radina.F90
radinaad.F90 radinatl.F90 vdfmain.F90 vdfouter.F90

phys_radi/uvradi.F90

pp_obs/ppobsa.F90 ppobsaad.F90 ppobsatl.F90

prism/couplo4_definitions.F90

setup/su0phy.F90 su0yomb.F90 su_surf_flds.F90 suafn1.F90 suafn2.F90 suafn3.F90
sucpicgfl.F90 sudim1.F90 supp.F90 suvnmb.F90

utility/prtjo.F90 updtim.F90

var/estsig.F90 estsiga.F90 jbchvari.F90 jbchvariad.F90 rdfpinc.F90 suanebuf.F90 suinfce.F90
sujb.F90 sujbwavelet.F90 vec2gp.F90 writesd.F90

Files modified(ODB):

cma2odb/initmdb.F90

ddl/ak_resat_averaging_kernel.sql

Files modified(PREPDATA):

programs/interpo.F90

Files modified(SCRIPTS):

build/arch/Makefile.in.linux64

def/an.def gen.def

gen/add_nrt_fire_chem anml anpl ansfc chem_setup chemarch_ml fetchobs gems_ifsnam.pl gems_setup get_fire_emis get_gems_surface get_nrt_fire_chem get_tm5_initcond getghgsfc getgrb getinigems getmars ifsmin ifstraj mkabs_fc mkabs_mctools mkabs_prepdata mkidta mklinks model prep_couplo4 prep_flux prep_initcond

sms/archivectm.sms prep_chem.sms sfc.sms

sms_an/fetchobs.sms

Files modified(SURF):

offline/module/yoephy.F90

Files deleted(IFS):

chem/tm5_fparam.F90 tm5_photolysis_rates.F90

Files deleted(SCRIPTS):

gen/aod_pp

sms/aod.sms gettm5inidata.sms libtm5.sms

AEOLUS

Michael Rennie - da7_SB38R2_Aeol_COPE - PASSIVE/BR

Aeolus L2B/C processing and assimilation

Expts: control=ftxz (copy of ftjl), test(passive)=ftxy

Further technical development (no meteorological impact) for Aeolus L2B/C processing and assimilation tasks; particularly developments of Aeolus processing as a COPE task and the production of L2C data.

Modifications in IFS, ODB and SCRIPTS to allow the Aeolus processing in COPE to work.

AEOLUS: A lot of changes to accommodate L2B continuous mode processing and a new L2B/C file format. Also, all the large ".expected" ASCII files have been removed from Perforce, as requested, which significantly reduces the size of the project.

Files created(AEOLUS):

ODB2_file_handling/Makefile.aeolus Makefile.aeolus.odb_test Objects.txt Objects_odb2.txt dummy_odb2_module.F90 odb2_module.F90

Scripts/do_linecount.py install_installtest.sc installtest_listing.txt.expected

Test/DirectBinaryIO/testoutput.TestUnformattedIO.expected.LINUX_sxf90

Tools/testoutput0.RunTestLongLines.sc.expected.LINUX_sxf90

support/testoutput.TestLunManager.expected.LINUX_sxf90

Files created(ODB):

ddl.ECMA/sat_aeolusl2c.sql

ddl/sat_aeolusl2c.sql

Files created(SCRIPTS):

gen/aeolus_l2b_parallel aeolus_l2b_prepare aeolus_l2b_tidy fetch_L1B_files fetch_L2BP_inputs

Files modified(AEOLUS):

AMD_file_handling/Makefile.aeolus Makefile.aeolus_odb.test ODB_to_AMDdata.F90 TestReadAMDdata.F90 TestWriteAMDdata.F90 readamddata.F90 writeamddata.F90

Application_Client_Example/application_client_example.F90

AuxCal_file_handling/TestWriteAuxCaldata.F90 readauxcaldata.F90 writeauxcaldata.F90

AuxClim_file_handling/Makefile.aeolus TestReadAuxClimData.F90 TestWriteAuxClimData.F90 readauxclimdata.F90 writeauxclimdata.F90

BUFR_file_handling/L1B_bufr2ee.F90 L1B_ee2bufr.F90 TestBufrWrapper.F90 TestL1B_ee2bufr.F90

BUFR_install/Set_config.linux_compiler make.bufr.lib.sc

Classification/TestClassification.F90

DataStructures/Test_AMD_Geoloc_ADS.F90 Test_AMD_Met_MDS.F90 Test_JobOrder_DataStructure.F90 Test_L1B_Cal_ADS.F90 Test_L1B_DataStructure.F90 Test_L2B_AMD_PCD_ADS.F90 Test_L2B_Geoloc_ADS.F90 Test_L2B_Grouping_ADS.F90 Test_L2B_Meas_Map_ADS.F90 Test_L2B_Meas_PCD_ADS.F90 Test_L2B_Mie_MDS.F90 Test_L2B_Mie_Wind_PCD_ADS.F90 Test_L2B_Rayleigh_MDS.F90 Test_L2B_Rayleigh_Wind_PCD_ADS.F90 Test_L2B_Wind_Profiles_MDS.F90 Test_L2C_Common_AssimPCD.F90 Test_L2C_MieVec_MDS.F90 Test_L2C_Mie_AssimPCD_ADS.F90 Test_L2C_RayleighVec_MDS.F90 Test_L2C_Rayleigh_AssimPCD_ADS.F90 Test_Working_Datastructure.F90 auxclim_sph.F90 datasetdescriptor.F90 l1b_cal_ads.F90 l1b_datastructure.F90 l1b_sph.F90 l2b_amd_sph.F90 l2b_geoloc_ads.F90 l2b_grouping_ads.F90 l2b_meas_pcd_ads.F90 l2b_mie_wind_pcd_ads.F90 l2b_proc_settings.F90 l2bc_datastructure.F90 l2bc_sph.F90 mainproductheader.F90 rbc_sph.F90

DirectBinaryIO/TestMpiBuffering.F90

HLOS_retrieval/Test_HLOS_Retrieval.F90 hlos_retrieval.F90

InputScreening/Test_Screening_AMD_Data.F90 Test_Screening_L1B_Data.F90 screening_rbc_data.F90

KVT_module/TestKVT_module.F90 kvt_module.F90

L1B_BRC_Grouping/TestBRCgrouping.F90

L1B_file_handling/TestReadAndWriteL1Bdata.F90 TestReadL1Bdata.F90 TestWriteL1Bdata.F90 readl1bdata.F90 writel1bdata.F90

L1B_geolocation_extraction/Extract_Geolocation.F90 L1B_pred_orb_to_ODB.F90 Makefile.aeolus Makefile.aeolus.odb_test

L2BC_file_handling/TestReadL2BCdata.F90 TestWriteL2BCdata.F90 readl2bcdata.F90 writel2bcdata.F90

L2B_AuxPar_file_handling/Test_Read_L2B_AuxPar_file.F90

L2B_WindResultExtraction/Makefile.aeolus Makefile.aeolus.odb_test TestWindResultExtraction.F90 WindResultExtraction_to_ODB.F90

L2C_construction/L2C_Processor.F90 Makefile.aeolus Makefile.aeolus_odb.test

LiteTestData/TestLiteDataModule.F90

Makefile.aeolus

Match_AMD/Test_Match_AMD_Module.F90 match_amd_module.F90

Meas_Selection_Weighting/TestSelAndWeighMeasurements.F90
select_and_weigh_measurements.F90

MieCoreProcessing/MieCoreScan.F90 PlotMieCoreAtmDBScanResult.F90
TestMieResponse.F90 Test_Mie_Spectral_Shape.F90

OpticalProperties/TestOpticalProperties.F90

RBC_FileHandling/TestWriteRBCdata.F90 readrbcdata.F90 writerbcdata.F90

RayleighBrillouinProcessing/GenerateRBCdata.F90 Test_correction.F90
calib_grid.F90 rayleighbrillouinprocessing.F90 rbc_table_dimensions.F90
tentispectrum.F90

Scripts/CheckVersionNumbers.py DatapackHandler.py
binary_datapack_listing.txt.expected build_L2BP.EXAMPLE.sc build_L2BP.KNMI.sc
build_L2BP.sc check_for_internal_compiler_error.sc install_L2BP.sc
install_binary_datapack.sc run_feedback_agent.py

Set_Makeoptions.sc

Test/Application_Client_Example/Makefile.aeolus
AuxCal_file_handling/Makefile.aeolus AuxClim_file_handling/Makefile.aeolus
BUFR_file_handling/Makefile.aeolus KVT_module/Makefile.aeolus
L1B_file_handling/Makefile.aeolus compare_result_hexdump main/Makefile.aeolus
support/Makefile.aeolus

ThinLayer/AE_TEST_AUX_PAR_2B_20050331T000000_20111231T000000_0000.EEF
AE_TEST_AUX_PAR_2C_20050331T000000_20111231T000000_0000.EEF

Tools/Test_difftool.F90 difftool.F90

auxiliary/TestAuxiliaryModule.F90 TestDummyAuxiliaryModule.F90
auxiliarymodule.F90

configure

external/Makefile.aeolus compute_groundtrack.c

main/L2B_processor.F90

readme.txt

schemas/AUX_RBC_HDR.xml AUX_RBC_HDR.xsd AUX_RBC_HDR_invalid.xml
AUX_RBC_SpecificProductHeader.xml AUX_RBC_SpecificProductHeader.xsd
EE_DataTypes.xsd L2B_AUX_PAR.xml L2B_AUX_PAR.xsd L2B_HDR.xml L2B_HDR.xsd
L2B_HDR_invalid.xml L2C_HDR.xml L2C_HDR.xsd L2C_HDR_invalid.xml
Validate_whole_L2BP_tree.py

support/Makefile.aeolus Objects.txt TestArraytools.F90 TestProfileInterpolate.F90

TestStringTools.F90 aeolusconstants.F90 arraytools.F90 f90_c_support.c logging.F90

stringtools.F90

Files modified(IFS):

module/aeolus_getamd_mod.F90

obs_preproc/sugoms.F90

op_obs/hretr.F90

Files modified(ODB):

cma2odb/ctxinitdb.F90 getdb.F90

ddl/sat_aeolus.sql

Files modified(SCRIPTS):

build/Makefile.root.aeolus

def/an.def

gen/L1B_gtt2odb2 aeolus_auxmet_odb aeolus_l2c fetchobs

Files deleted(AEOLUS):

Scripts/do_linecount.sc
*.expected
external/Makefile.aeolus.odb_test Objects.txt Objects_odb2.txt dummy_odb2_module.F90
odb2_module.F90

Files deleted(ODB):

ddl.ECMA/sat_aeolus.sql sathdr_screen_aeolus_hdr.sql
sathdr_screen_aeolus_sat.sql
ddl/sathdr_screen_aeolus_sat.sql

Files deleted(SCRIPTS):

gen/aeolus_auxmet aeolus_l2b

RE-ANALYSIS

David Tan, Paul Poli, Hans Hersbach, Patrick Laloyaux - eras_SB38R2_for_39r1 - BR

Reanalysis contributions taken from ERA-CLIM E20C

Expts: control=ftjl, test(passive)=furn

Changes that are neutral for Operations but used in ERA-CLIM. In IFS, a new parameter REDSIGO_HEIGHT is introduced to permit scaling of observation errors (default value 1.0). In ODB, standalone odb2 utlities are modified (used only in reanalysis, not in Operations). In Scripts, new Python scripts have been added (used only in reanalysis, not in Operations).

Files created(ODB):

module/binterpol.F90 datstat.F90 merge_model_info.F90 odb2_flag_definitions.F90
report_template.F90
tools/Odb2ifsreports_era.F90

Files created(SCRIPTS):

era/ainc_dexp_ContPlot.py ainc_dexp_PlotUtil.py ainc_dexp_calc.py ainc_dexp_plot.py
extract_min_diag.py odbviewer_map.py odbviewer_time.py plot_min_diag.py verify_e2.py

Files modified(IFS):

module/yomcosjo.F90
namelist/namcosjo.h
obs_error/suobserr.F90
obs_preproc/defrun.F90

Files modified(ODB):

module/odb2.F90
tools/Odb2_to_odb1_era.F90

Files modified(SCRIPTS):

`build/Makefile.root.odb Makefile.root.odbmain Makefile.root.odbport`

MARINE ASPECTS

Jean Bidlot - wab_SB38R2_for_CY39R1 - ACTIVE

Changes to shallow water calculation and surface air density.

Expts:

Coupled T511 runs:

- New density calculation: Summer from 20120601 for 2 months: fu72 (reference ftjq)
- Shallow water changes and new growth limiter: Summer from 20120601 for 1 month: fu33 (reference ftjq)
- All contributions: Winter from 20120101 for 3 months: fuj6 (reference ftjl)
- Stand alone global25 wave only: from 20120101 to 20120301: fuj4 (reference fu91)

The non-linear source term formulation for shallow water was reverted to the default WAM cycle 4 version (as it was before CY33R1).

The wind input source term was adapted for shallow water scaling.

When coupled to the IFS the wave model receives information about the surface air density, the calculation of which is now based on pressure, temperature and specific humidity at the lowest model level to avoid using 2m specific humidity (as used before) which is a pure diagnostic variable (i.e. it should be allow to change without impacting the model results). The spectral growth limiter was slightly relaxed.

Many technical changes: The code can deal with input of sea ice thickness, which together with sea ice fraction can be used to estimate wave attenuation in the sea ice (currently not an active option).

All gribex calls were removed as derived from nat_CY38R2_gribex. Changes in wam were taken BUT I had to adapt to Tomas's branch to using the default grib_api interface because his changes were made for a different version of grib_api

Spectral partitioning software was added to wam (not active).

output possible of sea ice cover, sea ice thickness, surface air density, convective velocity scale, mean square strain in sea ice, wave height, mean wave direction and mean wave period of spectral partions1 ,2 and 3. Only surface air density, convective velocity scale should become active in operations.

Proper evaluation of the input source terms at t=0 when the momentum and energy fluxes into the ocean are evaluated (i.e these fluxes are no longer set to 0.).

Minimum value for using altimeter wave heights was reset to 0.05m (from 0.5m).

Buoy collocation software updated.

Remove all use of COSD, SIND, TAN2D

Many other small technical changes.

Note: New wave parameters will need to be produced by operations:

- surface air density,
- convective velocity scale

Files created(WAM):

`Buoy/Makefile.wam.ibm bsdcol_off_line.F get_BUO_from_CEFAS_data.F get_BUO_from_IH_data.F get_BUO_from_JMA_data.F get_BUO_from_METNO_data.F get_BUO_from_NIWA_data.F get_BUO_from_SHOM_data.F get_BUO_from_newbuoy_data.F`

`Wam_oper/aki_ice.F cimsstrn.F ciwabr.F fndprt.F initnemocpl.F parmean.F sep3tr.F set_wflags.F updnemofields.F`

`module/yowintt.F yowtrains.F`

Files modified(IFS):

`phys_ec/ec_phys.F90 wvcouple.F90`

Files modified(SCRIPTS):

`build/Makefile.root.wam`

`sms/wamarchive.sms`

`wav/prep_wave wam_input wave_const wave_getwind wave_newverify wave_run wave_runcold wave_set_config wave_set_tstep wave_setgflag wave_setup wave_setup_3v wave_setup_-4v wave_setup_an`

Files modified(WAM):

`Alt/Makefile.wam.ibm axis_plotting.F curvef.F esf_preprocessor.F graph_plotting.F indlole.F pl_grid.F pl_grid_main.F plot_layout.F readpreb.F uraqcm.F uraqrd.F uraqrg.F urascat.F urascatm.F`

`Buoy/get_BUO_from_BSH_data.F get_BUO_from_KMA_data.F get_BUO_from_Oceanor_data.F get_BUO_from_Spanish_data.F mc_analysis_rearrng_ym.F mc_analysis_rearrng_ym_tz.F mc_analysis_scatter_plot.F mc_analysis_scatter_plot_ym.F mc_analysis_scatter_plot_ym_tz.F mc_analysis_stats.F mc_analysis_stats_ym.F mc_analysis_stats_ym_tz.F mc_cbsdm_scatter_plot.F mc_cbsdm_stats.F mc_ecmwf_rearrng.F mc_ecmwf_scatter_plot.F mc_ecmwf_stats.F mc_ecmwf_xyplot.F mc_plot_ts.F mc_read_and_blacklist.F mc_rearrng.F mc_rearrng_2centre_common.F mc_rearrng_3centre_common.F mc_rearrng_4centre_common.F mc_rearrng_5centre_common.F mc_rearrng_5day_common.F mc_rearrng_common.F mc_rearrng_global_common.F mc_rearrng_llmiss.F mc_rearrng_wam_common.F mc_scatter_plot.F mc_scatter_plot_2.F mc_stats.F mc_xyplot.F plotmap.F prep_box_m.F pstats.F qcbuoy.F`

`Sar/Makefile.wam.ibm preuwa.F prewvs.F uwapre.F wvspre.F`

`Wam_oper/Makefile.wam.ibm altas.F90 bouint.F bsdcol.F buildstress.F cal_second_order_spec.F check.F chief.F cireduce.F ciwaf.F class_wgrib.F cmpbls.F create_wam_bathymetry.F current2wam.F decode_integrated_parameter.F decode_point_spectra.F difdate.F femeanws.F fld2wam.F fldinter.F getspec.F getstress.F getwnd.F grdata.F grfield.F90 grib2wgrid.F ifstowam.F implsch.F incdate.F initialint.F initmdl.F intwaminput.F inwgrib.F kgribsize.F mbounf.F micep.F mintf.F mpcrtbl.F mpuserin.F newwind.F nlweigt.F notim.F out_onegrdpt_sp.F outbc.F outbs.F outcom.F outers.F outgrid.F outint.F outnam.F outspp.F outwnorm.F preset.F preset_wgrib_template.F prewind.F readwgrib.F readwind.F rfl4wam.F90 savstress.F sdissip.F sinput.F statsdir.F stresso.F`

`timin.F topoar.F uibou.F uiprep.F updatewd.F userin.F wamassi.F wamodel.F wamwnd.F wavemdl.F wdfluxes.F wgrib2fdb.F wgribout.F wvalloc.F wvdealloc.F`

`Wam_setup/create_wam_library create_wamassi_library run_bouint run_preproc run_preproc.fine run_preset run_preset.fine run_sat_preproc run_wamassi run_wamodel run_wamodel.fine`

`module/Makefile.wam.ibm yowcoup.F yowcout.F yowfred.F yowgribhd.F yowice.F yowintp.F yowmean.F yowparam.F yowunit.F yowwind.F`

Files deleted(WAM):

`Wam_oper/fld2fdb.F grb2wgrd.F gribpac.F inmars.F outwaminput.F setwgribhd.F spec2fdb.F`

Giovanna De Chiara - dig_SB38R2_charnock_bugfix - BugFIX

Fix for Charnock parameter

Expts: control ftzo, test ftyj

With the current configuration the constant Charnock value (0.018) is used in the minimization rather than the value as returned from the wave model. A change has been made in order to use the sea state (ocean-wave) dependent Charnock value for the estimation of the roughness length z0 over the ocean.

Files modified(IFS):

`setup/su_surf_flds.F90`

PREDICTABILITY

Kristian Mogensen, Frederic Vitart, Jean Bidlot, Linus Magnusson, Magdalena Alonso Balmaseda, Martin Leutbecher, Oyvind Breivik, Sarah Keeley, Sarah-Jane Lock, Tim Stockdale

Joint predictability division contribution

The main focus of this branch is the updates needed to run the coupled model from day 0 in the ENS system and the increase of the vertical resolution of the ENS system. The former involves an upgrade of the NEMO model in the IFS perforce group from 3.3.1 to 3.4.1 with coupling of WAM to NEMO.

Other changes:

- Tendency coupling option of SST and ice.
- Use of climatological lake SST and ice cover.
- Sea ice climatology changed for monthly forecasting system.
- Introduce atmospheric relaxation code.
- Work on the LIM2 sea model coupling (ongoing work).
- Unified (epsnemo+longrange) tropical storm tracking code.

- Introduce option to deactivate orographic gravity-wave drag contribution to dissipation rate in backscatter scheme.

Files modified(IFS): `climate/accnemoflux.F90 icestatenemo.F90 updclie.F90 updicetemp.F90 updnemoocean.F90 control/cnt4.F90 reresf.F90 stepo.F90 module/stoph_mix.F90 yoephy.F90 yommcc.F90 yomrlx.F90 yomsrlx.F90 namelist/naephy.h nammcc.h namrlx.h namstoph.h nemo/couplnemo.F90 getnemo.F90 ininemo.F90 ocean/sugco0.F90 phys_ec/callpar.F90 callparad.F90 callpartl.F90 ec_phys.F90 radintg.F90 radpar.F90 spbsgpupd.F90 vdfdifh.F90 vdfdifhs.F90 vdfdifhsad.F90 vdfmain.F90 vdfmains.F90 vdfmainsad.F90 vdfouter.F90 wvxf2gb.F90 setup/su0phy.F90 su0yomb.F90 sudim1.F90 sumcc.F90 surand1.F90 surlx.F90 transform/relaxgp.F90 utility/deallo.F90 updrlxref.F90 updtim.F90 wrresf.F90`

Files modified(OASIS3):

`src/getoasis3.F90 inioasis3.F90 putoasis3.F90 setoasis3.F90`

Files modified(PREPDATA):

`mc_tools/svgp2sp.F90 svsp2gp.F90 programs/intsst.F90 tcyc/storm.F90 traj.F90`

Files modified(SCRIPTS):

`def/eps_nemo.def longrange.def gen/bcsst getini getmars getrelax ifsmin ifstraj mkabs_tcyctools mkidta_eps mkidta_ocean mknam_fp model modeleps modeleps_nemo modelsv sekf_sm sv_def.h oce/archive_ml archive_sfc archive_ua checkrestarts chunk.h extrafields_create mm_create_sfc mm_create_ua model_nemoIFS ninosst_atmgrid saverestarts storm sms/BCSST.sms getini.sms getiniLeg.sms libnemocoup.sms modeleps_nemo.sms modeleps_tidy.sms nemo_tools.sms prep_tcyc.sms sfc.sms sms_an/eda_err_save.sms sms_oc/build_seasplot.sms check_extendrun.sms clean_longrange.sms cleantc.sms cpmodel_nemo.sms extendrecodegrib.sms iniatmos.sms ml_arc.sms ocflush.sms ocwavfcdata.sms ocwavini.sms tcyc.sms wav/wam_input wave_setup wave_setup_an`

Files modified(SURF):

`external/surfexcdriver.F90 surfrad.F90 surfseb.F90 interface/surfexcdriver.h surfrad.h surfseb.h module/surfexcdriver_ctl_mod.F90 surfrad_ctl_mod.F90 surfseb_ctl_mod.F90`

Files modified(WAM):

`Wam_oper/implsch.F initnemocpl.F mpuserin.F updnemofields.F userin.F wavemdl.F module/yowcoup.F`

PROBABLISTIC FORECASTING

Simon Lang - nesl_SB38R2_pertsfc0 - ACTIVE

Perturbing the land surface initial conditions of the ensemble

Expts: control=ftf0, test=fufq

Perturbations to the land surface initial conditions are added to the ensemble. The land surface perturbations are controlled by the prepIFS switch *LPERTICMGG* (in edageneral.xml). If activated, the land surface perturbations are generated from the EDA in *eda_mean.sms* and added to the initial conditions in *trans_an.sms*. The perturbed surface initial conditions are constrained to physical values in *trans_an.sms* via the program *ad-*

just_pertsfc.F90. A detailed description and meteorological evaluation can be found in the internal research memorandum RD13-065 (not published yet). If *LPERTICMGG* is deactivated, the results are bit-reproducible with CY38R2

Files created(PREPDATA):
`mc_tools/adjust_pertsfc.F90`

Files modified(PREPDATA):
`mc_tools/add_pert.F90`

Files modified(SCRIPTS):
`gen/mkabs_mctools sms/trans_an.sms`

ODB

Anne Fouilloux and Patricia de Rosnay - stf_CY38R2_SURFACE_v1b - ACTIVE

- stf_CY38R2_SURFACE_v1: contains all the initial development for adding ODB feedbacks for surface analysis; it was built on top of CY38R2 only
- stf_CY38R2_SURFACE_v3: contains Gabor's esuite branch (merged on 14/02/2013) and ODBs feedbacks (stf_CY38R2_SURFACE_v1)
- dap_CY38R2_dap_CY38R2_SURFACE_v4: scientific modifications to assimilate NESDIS/IMS data in case of snow covered conditions and to account for larger observations error for IMS than for SYNOP data.

Expts:

- Winter 2012-2013 from 2012122000-2013031000 - T511 fugk (dag_CY38R2_esuite) - T511 fuis (dap_CY38R2_dap_CY38R2_SURFACE_v4)
- Case study 2013 02 18 00 - T255 fuoq (dag_CY38R2_esuite) - T255 fuos (dap_CY38R2_dap_CY38R2_SURFACE_v4)
- Case study 2013 03 12 00 - T255 fupa (dag_CY38R2_esuite) - T255 fupb (dap_CY38R2_dap_CY38R2_SURFACE_v4)
- JFM 2012 2012010100-2012033112 - T511 ftjl (Gabor's control) - T511 fuob (dap_CY38R2_dap_CY38R2_SURFACE_v4)
- EDA 2012 20121115-20121231 - T399 10 members fuo8 (stf_CY38R2_SURFACE_v1b, still running and will be evaluated by Massimo et al) - T399 10 members fsqh (Gabor's control)

Surface analysis improvements (deterministic 4DVAR + EDA)

This branch contains changes allowing to store ODB feedbacks in MARS for the surface analysis and scientific changes related to the usage of snow (varno=71). We tried to clean as much as possible ssa project to ease future scientific developments. For EDA, T2M and RH2M perturbed observations are used in the surface analysis.

A new MARS group (SFC_MS) and associated reportype (NESDIS IMS) was introduced to cater for existing Nesdis IMS data (are now in ODB format).

A new variable called binary_snow_cover was introduced (varno=223).

ECMA.surf_conv has been removed; ECMA.conv is used for surface analysis too.

New ODB tables were added: surfbody_feedback contains ODB feedback for surface analysis

And when running in EDA mode, each member has its own surfbody_feedback_n table (where n is the member number) containing ODBs feedbacks for surface analysis.

The use of the NOAA/NESDIS IMS snow cover product is improved. In snow covered conditions, IMS is assimilated and the binary snow cover condition corresponds to 5cm of snow (instead of 10cm in 38r2 and previous cycles). Using 5cm is consistent with the relation between snow cover and snow depth which indicates more than 50% snow cover (for binary information) corresponds to more than 5cm snow depth. In addition NESDIS IMS observation error is increased to be twice larger than SYNOP observations error. So, in areas with good in situ data coverage, SYNOP data has more weight than NESDIS IMS, whereas in areas with sparse in situ observations the analysis still benefits from IMS.

Case studies experiments all show a clear positive impact on snow depth with 39r1 modifications compared to 38r2. Preliminary results (only 14 days so far) of the T511 experiments confirm the improved snow depth pattern with a slight positive impact on temperature and relative humidity forecasts.

Files created(ODB):

```
bufr2odb/bufr2odb_ims.F90
ddl.CCMA/surfbody_feedback.h
ddl.COUNTRYRSTRHBIAS/surfbody_feedback.h
ddl.ECMA/links_surfbody_feedback.sql nesdis_get.sql ssafb_surfbody_2m.sql
ssafb_surfbody_snow.sql surfbody_feedback.h
ddl.RSTBIAS/surfbody_feedback.h
ddl.SONDETYPERSTRHBIAS/surfbody_feedback.h
ddl/links_surfbody_feedback.sql nesdis_get.sql ssafb_surfbody_2m.sql
ssafb_surfbody_snow.sql surfbody_feedback.h
tools/Split_bufr_per_subtype.F90
```

Files created(SCRIPTS):

```
gen/add_surfbody_enda_to_sql.pl get_nearest_infile_date
sms_an/archive_ims.sms b2o_ims.sms convert_ims.sms mergeodb_2m.sms
mergeodb_snow.sms obstat_archive_ims.sms obstat_ims.sms
sms_era/obtime_ims.sms
```

Files created(SSA):

```
interface/init_sfc_events.h init_surfbody_feedback.h
sub/init_sfc_events.F90 init_surfbody_feedback.F90
```

Files modified(IFS):

```
canari/caratk.F90
common/yomdb_defs.h yomdb_vars.h
module/pardimo.F90 yomcoctp.F90 yomnmev.F90
obs_preproc/lndsyin.F90
op_obs/hretr.F90
phys_radi/rrtm_gasabs1a_140gp.F90
```

setup/cmoctmap.F90 cmoctmap_inv.F90 suvnmb.F90

var/ecset.F90 ecset_thsafe.F90

Files modified(ODB):

bufr2odb/bufr2odb_snow.F90 bufr2odb_synop.F90

cma2odb/ctxinitdb.F90 getatdb.F90 initmdb.F90 putatdb.F90 store_enda.F90

ddl/cma.h ensemble.h hdr.h obstype.h ssa_robhdr_2m.sql ssa_robhdr_snow.sql ssa_robody_2m.sql ssa_robody_snow.sql type_definitions.h varno.h

include/bufr2odb.h

module/getval_module.F90

scripts/create_ioassign

tools/Bufr2odb.F90 Split_bufr_data.F90

Files modified(SCRIPTS):

def/an.def enkf.def fsobs.def gen.def

gen/archive_obsgroup bufr2odb convert_obsgroup copyodb create_ioassign ens_fetch_fields fetchobs getgrbe merge_iomap.pl mergeodb mkabs_b2otools model obstat odb2odb1 preobs run_parallel ssaana uniquecol.pl update_ensemble_metadata

sms_an/archive_obsgroup.sms convert_obsgroup.sms mergeodb.sms ssaana.sms

sms_era/obtime.sms

Files modified(SSA):

common/stmfunc.h

interface/calc_distance.h fg2obs.h oiinc.h print_summary.h

module/comobs.F90 comphy.F90 limits.F90 nmbring.F90 parobs.F90 yomarrays.F90 yomiodssa.F90 yomssa.F90 yomsur.F90

namelist/namssa.h

plot/coordinates.F90 fdb_output.F90 print_nml.F90 print_summary.F90

sub/biasrms.F90 feedback_odb.F90 fg2obs.F90 ice_analysis.F90 inisnw.F90 inisst.F90 init2m.F90 initial_rejection.F90 land_obs.F90 oiinc.F90 oiupd.F90 redundant_obs.F90 reg_to_gg.F90 scan_cma_odb.F90 snow_analysis.F90 snow_fg.F90 ssa.F90 sucsnw.F90 t2m_analysis.F90

util/alloc_mem.F90 array2field.F90 calc_distance.F90 field2array.F90 free_mem.F90 setcomssa.F90 setnmb.F90

Files deleted(ODB):

ddl.ECMA/smon_hsris.sql smon_hsris_flag.sql smon_mwimg_allsky.sql smon_slmoist.sql

ddl/smon_hsris.sql smon_hsris_flag.sql smon_mwimg_allsky.sql smon_slmoist.sql

Files deleted(SCRIPTS):

gen/getsmon mkabs_satmon satmon_getdat satmon_monitor smon smon_clean smon_def smon_funcs

sms/remove_wsclient.sms

sms_an/getsmon.sms mergeodb_surf.sms satmon.sms smon.sms smon_airs.sms smon_clean.sms smon_iasi.sms

Files deleted(SSA):

interface/control_ssa.h feedback.h melting.h output.h plotdata.h print_field.h print_geo.h print_infl_fields.h print_infl_obs.h print_obs_stat.h print_rawobs.h print_report.h scan_cma.h scan_obs.h scan_odb.h setlim.h setnum.h updcal.h

module/comana.F90 numcon.F90 yomobsstat.F90 yomsci.F90 yomsco.F90
yomssmi_ice.F90

plot/output.F90 plotdata.F90 print_field.F90 print_geo.F90 print_infl_fields.F90
print_infl_obs.F90 print_obs_stat.F90 print_rawobs.F90 print_report.F90

sub/control_ssa.F90 ice_cressman.F90 melting.F90 nesdis_fill.F90 scan_obs.F90
scan_odb.F90 sub_prep_nes.F90

util/setlim.F90 setnum.F90 updcal.F90

ESUITE

Gabor Radnoti and Deborah Salmond - das_CY38R2_esuite - ACTIVE

Updates to CY38R2 for esuite

These are the chages between 38r2 to 38r2E.

Files created(PREPDATA):

programs/Wavelet_Filter.F90

Files created(SCRIPTS):

sms/remove_wsclient.sms

sms_an/odb2odb1_cris.sms

Files created(WAM):

Wam_oper/wdfluxes.F

Files modified(IFS):

module/varbc_airep.F90 varbc_rad.F90 yoecumf.F90 yoecumf2.F90 yoegwd.F90
yoegwwms.F90 yoephy.F90

mwave/mwave_obsop_ad.F90 mwave_obsop_tl.F90

namelist/naephy.h namgwd.h namgwwms.h

obs_preproc/gefger.F90

op_obs/amv_oberr.F90 hop.F90 hopad.F90 mopitt_ak_op.F90

phys_ec/callparad.F90 callpartl.F90 cuascn.F90 cubasen.F90 cupdra.F90
cupdraad.F90 cupdratl.F90 gwdrag_wms.F90 sucumf.F90 sucumf2.F90 sugwd.F90
sugwwms.F90 vdfexcu.F90 vdfhghtn.F90 vdfmain.F90 vdfouter.F90

phys_radi/rrtm_gasabs1a_140gp.F90 srtm_srtm_224gp_mcica.F90

setup/su0phy.F90 su0yomb.F90 su_surf_flds.F90 sulap.F90

utility/prtjo.F90

var/pregprh.F90 suanebuf.F90 sujbwavelet.F90 troplev.F90

Files modified(IFSAUX):

module/mpl_allreduce_mod.F90 mpl_alltoallv_mod.F90 mpl_broadcast_mod.F90 mpl_gatherv_-
mod.F90 mpl_recv_mod.F90 mpl_send_mod.F90

Files modified(ODB):

bufr2odb/bufr2odb_205.F90 bufr2odb_aircraft.F90 bufr2odb_airs.F90
bufr2odb_amsre_1d.F90 bufr2odb_ascat.F90 bufr2odb_asr.F90 bufr2odb_atms.F90
bufr2odb_atovs.F90 bufr2odb_cris.F90 bufr2odb_fy3.F90 bufr2odb_gch1.F90
bufr2odb_gch2.F90 bufr2odb_gch3.F90 bufr2odb_gch4.F90 bufr2odb_gch5.F90

bufr2odb_grad.F90 bufr2odb_iasi.F90 bufr2odb_iscat.F90 bufr2odb_meris.F90
bufr2odb_metar.F90 bufr2odb_modisaer.F90 bufr2odb_msg.F90 bufr2odb_mwri_1d.F90
bufr2odb_oscat.F90 bufr2odb_paob.F90 bufr2odb_pgps.F90 bufr2odb_qscat.F90
bufr2odb_radio.F90 bufr2odb_radio_lat_long.F90 bufr2odb_rain_rates.F90
bufr2odb_reo3.F90 bufr2odb_satob.F90 bufr2odb_scat.F90 bufr2odb_snow.F90
bufr2odb_ssmi.F90 bufr2odb_ssmis_1d.F90 bufr2odb_synop.F90 bufr2odb_temp.F90
bufr2odb_tmi_1d.F90 bufr2odb_windprofiler.F90 bufr2odb_windsat.F90
fy3_corrections.F90

cma2odb/ctxinitdb.F90 getdb.F90 map_reportype.F90

ddl/obsort_hdr2scatt_body.sql varbc_airep_robhdr.sql

tools/Adjust_seqnos.F90

Files modified(PREPDATA):

programs/Ens_Spread_Cal.F90 unbal_eda.F90

Files modified(SATRAD): gensatim.F90

rttov/mw_scatt/rttov_integratesource_tl.F90

Files modified(SCRIPTS):

build/arch/Makefile.in.ibm_power7 arch/Makefile.in.linux64

def/an.def eps_nemo.def fc.def fsobs.def gen.def

era/varbc_merge_sort.py

gen/anpl archive_satim biassave chem_setup chemarch_ml convert_obsgroup
eda_err_save ens_errors ens_fetch_fields ens_stats_gather ens_stats_mem
fc_sens_prepare fetcherr fetchmars fetchobs get_fire_emis get_nrt_fire_chem
get_tm5_initcond ifsmin ifstraj mkabs_an mkabs_black mkabs_fc mkabs_satim
mknam_fp model obstat obstat_init pregeos prep_couplo4 prep_flux prep_initcond
run_parallel satimsim simulobs2odb text2odb vardata web_update

metview/climate_obs.met

sms/archivectm.sms libmozart.sms model.sms p4setup.sms prep_couplo4.sms
verify.sms wamverify.sms

sms_an/a2o_conv.sms a2o_surf_conv.sms archive_obsgroup.sms asci2odb.sms
convert_obsgroup.sms cope_obsgroup.sms enkf_ecfs.sms getxb.sms monitoring.sms
odb1odb2.sms postenkf.sms postenkf1.sms vardata.sms

sms_era/get_obtime.sms

Files modified(WAM):

Wam_oper/altas.F90 getspec.F intpol.F oifield.F preset.F sdissip.F stresso.F upwspec.F
wamassi.F wamodel.F wgrib2fdb.F

OBSTAT

Mohamed Dahoui - mo3_CY38R2_39R1 - BR

Improvements to Obstat

- Use of one generic SQL request for all data types. The same request is valid for EDA
- Use the sensor ID 15 for NOAA-18/MHS instead of the AMSUB ID (004)

- Use the IFS cloudiness information for AMSUA, AMSUB, MHS, MWTS and MWHS instead of using obstat own cloud detection module
- few improvements of the code
- Add the monitoring of surface analysed parameters (T2m, H2m and snow depth)
- Reduce the SCRATCH usage to the minimum. All the plots are produced on TMPDIR and the intranet publishing is done from there.
- Systematic usage of the supercomputer online MARS database. The necessary triggers were updated
- The plotting part of suite can be switched off if not necessary. This is controlled by OBSTATPLOT (classical obstat plots), TIMESERIES (obstat time series), VARBC_PARAMS (timeseries of VARBC pred) and CONDITION_NUMBER (for condition numbers). However these keywords need to be added to the prepIFS interface. The default values are :

  TIMESERIES=true VARBC_PARAMS=false CONDITION_NUMBER=false OBSTATPLOT=no
- Update the statistics definition files with contribution from Phillipe Lopez

Files modified(OBSTAT):

`globvar.F90 statsoft.F90 enlstatarray.F90 iniitemloc.F90 inisoftarea.F90 inisoftdef.F90 inisoftflag.F90 inisoftinstr.F90 inisoftstat.F90 inisoftstream.F90 mpsoft.F90 obstat_add_grib.F90 odb2read.F90 odbscaling.F90 updsoft.F90`

Files modified(SCRIPTS):

`obstat obstat_init an.def get_obtime.sms obtime.sms`

Files created(SCRIPTS):

`obstat_archive_ims.sms, obstat_ims.sms`

TECHNICAL, CLEANING and OOPS

John Hague - ibj_CY38R2_P7_perf_1 - BR

Optimisation for P7

This is a first attempt to look for possible performance improvements for 4dvar and the model on the P7.

Only changes that did not change the results at the bit level were considered.

The main changes so far are to add OMP parallel regions to MXMAOP, VERINT (when not called in parallel region), and WVCOUPLE. Performance is improved by approximately 1%. Approx 40s are moved from Serial to Parallel, so this should have a good effect on scaling.

Extra DR_HOOK calls were added to VERINT, LEDIR, LEDIRAD, LEINV, and LEINVAD to identify calls to DGEMM.

To enable DR_HOOK to more usefully identify the time spent in certain routines, DR_HOOK calls were placed around the GSTATS_BARRIER calls in EC_PHYS_DRV, TRGTOL, TRLTOG, TRLTOM, and TRMTOL.

Test times in experiment fr7e are:

```
        ----240_8----    ---480_16----
        Before  After   Before  After
  Model 3178    3140    1126    1087
  4dvar 2634    2602
```

Files modified(ALGOR):

`external/linalg/mxmaop.F90`

Files modified(IFS):

`adiab/sitnuad.F90 spcsi.F90 spcsiad.F90`
`phys_ec/ec_phys_drv.F90 ec_phys_drv_ad.F90 wvcouple.F90`
`utility/gstats_label_ifs.F90 verint.F90 verintad.F90`

Files modified(TRANS):

`module/ledir_mod.F90 ledirad_mod.F90 leinv_mod.F90 leinvad_mod.F90 trgtol_mod.F90`
`trltog_mod.F90 trltom_mod.F90 trmtol_mod.F90`

John Hague - ibj_CY38R2_alloc_bug - BR

Fix un-ALLOCATED arrays passed to subroutines

Files modified(IFS):

`adiab/lacdyn.F90 lapineb.F90 larcinaad.F90`
`phys_ec/callparad.F90 ec_physg.F90 phys_ad.F90 phys_nl.F90 phys_tl.F90 raddrv.F90`

John Hague - ibj_CY38R2_drhook_p7_hpm - BR

Dr.Hook MFlops for P7

Enables MFLOP counts to be collected for each subroutine on the P7

If HPM_GROUP=150 and DR_HOOK_OPT="hpmprof" are exported in the run script, then the drhook.prof.n mflop count will not include the VSX instruction contribution (e.g. from DGEMM), but will give the correct divide percentage.

If HPM_GROUP=141 and DR_HOOK_OPT="hpmprof" are exported in the run script, then the drhook.prof.n mflop count will include the VSX instruction contribution (e.g. from DGEMM), but will not give the correct divide percentage. (4 flop VSX instructions will be counted as divides!)

You pays your money, you takes your choice!

drhook.c has to be compiled on the P7, where PMAPI_P7 is defined.

Files modified(IFSAUX):

`support/drhook.c`

Deborah Salmond - das_CY39_clean - BR

Code cleaning and output reduction

Files modified(IFS):

climate/updrgas.F90
control/cnt4ad.F90 cnt4tl.F90 reset_spert.F90
module/traj_main_mod.F90
phys_ec/callpar.F90 callparad.F90 callpartl.F90
utility/gpnorm_gfl.F90

Files modified(OASIS3):

src/inioasis3.F90

Files deleted(IFS):

phys_ec/gems_dealloc.F90 gems_dealloc_ad.F90 gems_dealloc_tl.F90

Deborah Salmond and Anne Fouilloux - das_SB39_NEW_BLACK

Clean of BLACK sql's

Files modified(IFS):

obs_preproc/black.F90 blackhat.F90

Files modified(ODB):

cma2odb/ctxinitdb.F90 getdb.F90
ddl.ECMA/ECMA.dep
ddl/black_robhdr_10.sql black_robhdr_2.sql black_robhdr_3.sql black_robhdr_4.sql black_robhdr_6.sql black_robhdr_8.sql black_robody_10.sql

Files deleted(ODB):

ddl.ECMA/black_allsky.sql black_atovs.sql black_gpsro.sql black_satob.sql black_scatt.sql
ddl/black_allsky.sql black_atovs.sql black_gpsro.sql black_robody_5.sql black_satob.sql black_scatt.sql

Deborah Salmond, Mike Fisher and Yannick Tremolet - das_CY39_January2013 - BR

For OOPS 3D-Var

Files created(OOPS):

Copy of GIT repositories oops and oops_ifs

Files created(SCRIPTS):

build/Makefile.root.oops

Files modified(IFS):

module/gom_mod.F90
obs_preproc/suobarea.F90 suobs.F90

oops/allobs_mod.F90 error_covariance_3d_mod.F90 fields_io_mod.F90 fields_mod.F90 geometry_mod.F90 gom_setup.F90 model_mod.F90 obsvec_mod.F90

op_obs/hop.F90 hopad.F90 hoptl.F90

setup/suoph.F90

Files modified(ODB):

ddl/ecset.sql

Files modified(SCRIPTS):

build/arch/Makefile.in.ibm_power7 perl/depend.pl perl/findbr.pl

Files deleted(OOPS): dummy.F90

Tomas Wilhelmsson - nat_CY39_geometry_NEW - BR

Geometry for OOPS

Tomas Wilhelmsson - nat_CY38R2_prepdata - BR

Make uvtovod and vod2uv -P behavior consistent

Files modified(PREPDATA):

programs/Spectral_Filter.F90 orfit.F90 uvtovod.F90 vod2uv.F90

Tomas Wilhelmsson - nat_CY38R2_reprod - BR

Fixes to run CY39 with LREPRO4DVAR enabled

Files modified(IFS):

module/varbc_setup.F90

Files modified(SCRIPTS):

def/an.def gen/bufr2odb

Tomas Wilhelmsson - nat_CY38R2_vareps - BR

Enable post processing of parameters 230021 and 230022

Files modified(IFS):

module/yomvareps.F90 setup/suvareps.F90 utility/reset_accfie_vareps.F90

Tomas Wilhelmsson - nat_CY38R2_pp_interpolation - Not-BR

Update TL/AD of ppintp to match nonlinear code again

Expt: fv1b-Online TL/AD test in a T511 4D-VAR

Also remove previous, now inactive, code.

Files modified(IFS):
pp_obs/pp2dint.F90 ppintp.F90 ppintpad.F90 ppintptl.F90

Tomas Wilhelmsson - nat_SB39_NEW_gribex - BR

Final removal of gribex

Files created(PREPDATA):
programs/getres.F

Files modified(IFS):
climate/updclie.F90 updclie_co2.F90
control/cnt3.F90
dia/grib_code_message.F90 preset_grib_template.F90 wrbudg.F90 wroutspgb.F90
fullpos/sualfpos.F90 sufpgrib.F90
module/iostream_mix.F90 testvar_mix.F90 traj_main_mod.F90 trajectory_mod.F90
yomgrib.F90 yomtraj.F90
phys_ec/wvcouple.F90 wvxf2gb.F90
setup/su_grib_api.F90 suallo.F90 sugrib.F90 suoph.F90 suspec.F90 suspecb.F90
utility/dealfpos.F90 deallo.F90 gstats_label_ifs.F90 mod_ini.F90
save_test4dinc.F90 write_grid_grib.F90 write_grid_traj.F90
write_wavelet_initcv_grib.F90
var/grbspa.F90 sujbwavelet.F90 suscal.F90

Files modified(IFSAUX):
module/grib_api_interface.F90

Files modified(PREPDATA): svtools.F90
programs/forceinv.F90

Files modified(SATRAD):
cmem/cmem_atm.F90 cmem_setup.F90

Files modified(SCRIPTS):
gen/mkidta mkidta_ocean
sms/inidata.sms

Files modified(WAM):
Wam_oper/current2wam.F fld2wam.F getspec.F intwaminput.F inwgrib.F kgribsize.F readwind.F
wgrib2fdb.F wgribout.F

Files deleted(IFS):
climate/updclie_aer.F90
dia/class_grib.F90 pregrbenc.F90
module/grib_handles.F90 grib_header_mix.F90
utility/grid_from_grib.F90 read_grid_grib.F90

Files deleted(IFSAUX):
grib_io/grib_close.F grib_info.F grib_open.F grib_read.F grib_rewind.F
grib_set.F grib_write.F

include/grib_internal.h

programs/decret.F gribdiff.F gribtrace.F splitgrib.F

Files deleted(ODB):

extras/gribex/*

Files deleted(PREPDATA):

mc_tools/comp_add_p2c.F90 comp_combslb.F90

module/modd_grib.F90 write_grib.F90

odds/getres/Makefile.old getres/getres.F modify_grib/Makefile.old modify_grib/modify_grib.F90

programs/albedo.F90 aversd_globe.F90 ecoclimap_write.F90 encspor.F90 fixsncl.F90 get.F90 pcgausf.F90 pcz0bln.F90 put.F90 resetz0.F90 usnavy.F90

scripts/create_orog

Files deleted(REANAL):

Mon/Makefile.eras code_24.F90 edates.F90 grib_open_read.F90 mamemi.F90 monanin.F90 monthly_accu.F90 monthly_mean.F90 plot_an_incr.F90 plot_curves.F90 wrgrib.F90

biascor/Makefile.eras bracm.F check_group.F ctgdef.F eval_homogenized_table.F90 fbimcnv.F fdb2imf.F fdb2sta.F imfio.F jdsqcv.F mix_outstat.F plotvrt.F qcflags.F read_country.F read_feedback.F read_homogenized_table.F90 read_outstat.F read_stgroup.F solar.F vrtprfl.F

Files deleted(SATRAD):

pre_screen/griborg.F90

Files deleted(SCRIPTS):

gen/getino3

Files deleted(WAM):

Wam_obsolete/archive.F climate.F cliname.F cloarc.F fldplt.F fldplt_global.F fldplt_medite.F gfile.F grdata.old.F gribpac_medite_old.F gridpac_global_old.F gsfile_cy_205.F gsfile_ecfile.F gsfile_oper.F gsfile_unicos.F openfil_cy_205.F plotint.F plotint_global.F plotint_medite.F pospro_global.F pospro_global_oper.F pospro_medite.F pospro_medite_oper.F preuwa.F savrest_old.F sfile.F topoar.old.F

Tomas Wilhelmsson and Sami Saarinen - nat_SB38R2_Sami_bug_fixes - BR

Portability fixes for Message Passing

Files modified(IFSAUX):

module/mpl_barrier_mod.F90 mpl_buffer_method_mod.F90

Files modified(ODB): varindex_module.F90

Files modified(WAM):

Wam_oper/bouinpt.F getspec.F grb2wgrd.F grib2wgrid.F mpbcastscfld.F mpdecomp.F mpfldtoifs.F mpgatherbc.F wavemdl.F

Glenn Carver - nagc_CY39_rm_intel_if_mods - BR

Removes redundant ifcore.F90 and ifport.F90 modules in ifsaux

Glenn Carver - nagc_CY39_open_status - BR

Adds STATUS='OLD' to OPEN statements to suecrad

OPEN statement in SUECRAD does not use STATUS="OLD". This means file has unknown status causing the file to be treated as NEW and an empty file will be created if the file is missing. This causes any error checking code not to execute as the OPEN is not in error. Adding STATUS='OLD' ensures error code correctly executes.

Glenn Carver - nagc_CY39_griberrmsg_fix_das - BR

Fixes bug where error message from grib_api would always return 'Unknown error

Wrong variable was passed to grib_api routine grib_get_error_string() causing subroutine err_msg in ifsaux/module/grib_api_interface.F90 to print 'unknown error'.

Glenn Carver - nagc_CY39_rename_namelists - BR

Renames namelists to use .nam.h extension

Changes agreed in OOPS technical meeting Dec. 2012.

IFS namelists to change from .h to .nam.h extension with code changes as required.

```
Script & files to produce branch in : ~nagc/ifs/cy39/namelists. Files are:
rename_namelists - script
rename_namelists.log - logfile from run of script
rename_namelists.all_namelist_files - list of all namelist files in CY39.
rename_namelists.edited_namelist_files - list of namelist files that changed name.
rename_functions.edited_srcfiles  list of source files edited.
```

Note: namelists in surf and wave model were not changed. Gianpaolo requested this change to be done at a later cycle.

Glenn Carver - nagc_CY39_change_interfaces - BR

Removes INTERFACE/END INTERFACE statements from code

Expts: control=fuff, test=fuxw

Changes agreed in OOPS technical meeting Dec. 2012 For all .F90 source files in which INTERFACE / END INTERFACE statements surround #include interface .h files, this branch removes those statements placing them

in the enclosed .h files. This is done to promote a standard representation of .h interface files. All projects are inspected and code changed where necessary. e.g. for any .F or .F90 file which have:

```
INTERFACE
#include "sub.h"
END INTERFACE

becomes:

#include "sub.h"
```

This branch was generated by a script in nagc/ifs/cy39/interfaces. Directory contents:

```
mv_interfaces                    Script to generate branch.
mv_interfaces.edited_interfaces  .h files with INTERFACE/END INTERFACE in .F90 src
mv_interfaces.edited_srcfiles    list of .F90 src files edited by the script.
mv_interfaces.log                output log of script.
changeint.py, findintfb.py       python scripts required by mv_interfaces
```

Glenn Carver - nagc_CY39_rename_functions - BR

Include (.h) files with statement functions renamed to .func.h

As in OOPS technical meeting minutes of 5/12/2012, it was agreed that .h files containing statement functions would be renamed to have a .func.h suffix. Files in 'surf' and 'wam' projects have not been changed.

```
Script & files to produce branch in : ~nagc/ifs/cy39/functions. Files are:
rename_functions  script
rename_functions.log  logfile from run of script.
rename_functions.all_function_files  list of all statement func files in CY39.
rename_functions.edited_function_files  list of statement func files that changed.
rename_functions.edited_srcfiles  list of source files edited.
```

Glenn Carver - nagc_CY39_drhook_circ_fix - BR

Fix bug and remove circular dependency in DrHook code

- Fixed bug in dr_hook_util_multi.F90 where call to dr_hook_util was passing incorrect number of arguments. Also added include "dr_hook_util.h".
- Resolved circular dependency between the code in yomhook.F90 and dr_hook_util.F90 if yomhook.intfb.h is auto-generated. Addressed by passing LHOOK as an argument and removing USE YOMHOOK. ONLY clause was also added to other USE statements in dr_hook_util to improve generation of interface block. dr_hook_util and dr_hook_util_multi should be included in the YOMHOOK module.

Files modified(IFSAUX):

```
include/dr_hook_util.h dr_hook_util_multi.h module/yomhook.F90
support/dr_hook_util.F90 dr_hook_util_multi.F90
```

Glenn Carver, Nils Wedi - nagc_SB39_NEW_gribiofix

Fix bug in output of GRIB files when not using FDB.

When FDB is not used for model I/O, ifs/dia/wroutspgb.F90 can be called multiple times per timestep if namelist output to pressure level, theta level, PV level or model level is selected. However, the default write mode is 'w' which causes previous files to be overwritten making only model level output possible. This affects OpenIFS & the test environment.

The default write mode has been changed to 'a'. Non-FDB I/O is now consistent for spectral (SH) & gridpoint (GG) files, both append to file if one of same name already exists.

Files modified(IFS):

```
dia/wroutspgb.F90
```

Stephane Martinez - das_CY39_NEW_V7 - BR

Portability fixes

Files modified(AEOLUS):

```
edit //depot/user/das/das_CY39_NEW_V7/aeolus/Scripts/arpifs_excluded_files
```

Files modified(ALGOR):

```
module/control_vectors_data_mix.F90
```

Files modified(IFS):

```
dfi/copgfl.F90 corgfl.F90 module/yomcva.F90 oops/error_covariance_3d_mod.F90
var/sualctv.F90 sujb.F90 suscal.F90 suvazx.F90
```

Files modified(ODB):

```
lib/Odb2Odb1.cc tools/Odb2Odb1Main.cc
```

Files modified(SCAT):

```
oretrieve/invert_owind.F oscat_write_bufr.F programs/oscat_filter.F
```

Files created(SCAT):

```
module/datstat_scat.F
```

Files deleted(SCAT):

```
module/datstat.F
```