RESEARCH DEPARTMENT MEMORANDUM

To:	RD Scientific Staff and Consultants
Copy:	HR, HO, HMD, HMAS, HMOS, John Hodkinson, François Bouttier, Claude Fischer, Ryad El Khatib, Karim Yessad, John Hague
From:	Deborah Salmond et al.
Date:	March 26, 2010 File: R48.3/DS/1022
Subject:	**IFS Memorandum Cycle CY36R3**

Cycle 36r3 was created in January-March 2010.

Modified libraries: algor ifs obstat oasis3 odb prepdata satrad scat scripts ssa surf trans wam

Contributors:

Gianpaolo Balsamo, Peter Bauer, Peter Bechtold, Anton Beljaars, Bill Bell, Jean Bidlot, Niels Bormann, Souhail Boussetta, Roberto Buizza, Paul Burton, Mohamed Dahoui, Dick Dee, Anne Fouilloux, Enrico Fucile, Alan Geer, Iliana Genkova, John Hague, Jan Haseler, Hans Hersbach, Elias Holm, Marta Janiskova, Peter Janssen, Fatima Karbou, Martin Koehler, Martin Leutbecher, Philippe Lopez, Dingmin Li, Qifeng Lu, Marco Matricardi, Jean-Jacques Morcrette, George Mozdzynski, Joaquin Munoz Sabater, Gabor Radnoti, Patricia De Rosnay, Iain Russell, Deborah Salmond, Glenn Shutts, Martin Steinheimer, Tim Stockdale, Yuhei Takaya, David Tan, Adrian Tompkins, Yannick Tremolet, Nils Wedi, Tomas Wilhelmsson, Agathe Untch

SCIENTIFIC CHANGES

Jean Bidlot

Technical changes and land recognition in the error specification in altimeter data assimilation.

There is now a simple scheme for the detection of land such that an altimeter observation cannot influence a model point that is on the other side of a land mass.Many technical changes were also implemented.

Significant changes:

- oifield was modified by prescribing that any altimeter observation can only modify the value at a given grid point if there is a direct line of view over sea between the observation location and the model point. The proxi for the land/sea mask is taken from the wave height field. The correlation length used to prescribe the errors in the altimeter data assimilation can now vary from grid point to grid point, even though it is now set to a constant number everywhere (150km for resolution lower than 0.3 and 300km otherwise).
- It was found that updatewd (the wind speed update following altimeter assimilation) required too much memory, especially when running on a small number of processors. This was connected to the inability of the code to scale the size of all arrays containing the wave spectra with NPROMA (the inner loop/ openMP chunking parameter). All relevant routines were modified accordingly.
- Speudo global norms of the input and output to the wave model when coupled to IFS are now computed for the primary PE. They are obtained from the local norms on each processor (hence they could different if different number of precessors are used).
- The components of the Stokes drift can be returned to the IFS when LWSTOKES is set to true in the IFS.
- Operatinal TOPAZ surface currents can be used in the limited area model configuration. The components of the ocean currents as seen by WAM can be output as two new wave parameters (131/132). The stand alone sms suite was adapted to have a separate family for surface current retrieval and to be able to use the number of threads as specified by prepIFS.
- Bug in altcol connected to an array bound violation was removed.
- Buoy software moved to this cycle. This includes all modifications of bufr decoding software to deal with the change implemented in emoslib version 351 that required to use of a double precision array for the decoded data.
- Shorter along track averaging of the Jason-2 altimeter data in the operational configuration of the limited area model (medite10) to be in line with what is done with the other satellites and with the 11km resolution of medite10.
- Wind speed direction as archived by the operational wave model is used a long side the archived neutral wind in all stand alone runs.

Minor changes:

- Square root in the Tmax calculation protected for negative values that might arise from rounding errors.

- The array containing the output points (IJAR) relabelled accordingly when 2D model decomposition.
- outspp now works in parallel.
- Problem with FFLAG and GFLAG for altimeter data fiexed in wamodel.
- Decoding of T2048 fields now possible.
- wavini was moved from the const family to be along side getini in the suite definiton of type an.
- Archiving of forecast output every hour is now possible even when the analysis is only available every 6 hours.
- Cold start run, when needed will make use of ERA-interim wind from January 1989 to December 2000. Sea ice fraction is also requested as it is needed for after the cold start run.
- Norms are now referring to w* instead of Zi/L as w* is actually used.

Files created(SCRIPTS):

`sms/wamcurrent.sms`

`wav/wave_getcurrent`

Files created(WAM):

`Buoy/Makefile.wam.ibm Makefile.wam.sgi 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_cbsdm_scatter_plot.F mc_cbsdm_stats.F mc_rearrng_llmiss.F prep_box_m.F`

`Wam_oper/statsdir.F`

Files modified(IFS):

`module/yoephy.F90 yoewcou.F90`

`phys_ec/wvcouple.F90`

`setup/su0phy.F90`

Files modified(SCRIPTS):

`def/an.def wam.def`

`sms/wamarchive.sms wambuoycol.sms`

`wav/prep_wave wam_input wave_getalt wave_getwind wave_run wave_setgflag`

Files modified(WAM):

`Alt/altcol.F debac.F debfl.F debu.F enrac.F enrfl.F inmarsb.F urabu5.F`

`Buoy/bmcol.F bmcol_rg.F buoycol.F buoydec.F buoydecode.F debuoy.F drifterdecode.F mc_analysis_rearrng.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_distribution.F mc_ecmwf_rearrng.F mc_ecmwf_scatter_plot.F mc_ecmwf_stats.F mc_ecmwf_xyplot.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_6centre_common.F mc_rearrng_common.F mc_rearrng_global_common.F mc_rearrng_wam_common.F mc_scatter_plot.F mc_scatter_plot_2.F mc_stats.F mc_xyplot.F mppt_map.F mppt_scatter.F plotmap.F pstats.F qcbuoy.F shipdec.F shipdecode.F station_ol.F`

`Sar/debnv.F decouwa.F decowvs.F eninv.F`

Wam_oper/altas.F bsdcol.F chief.F create_wam_bathymetry.F current2wam.F fdur.F femean.F femeanws.F fkmean.F fldinter.F fustar.F fwsea.F grb2wgrd.F ifstowam.F implsch.F intwaminput.F kurtosis.F meansqs.F mpdecomp.F mwp1.F mwp2.F oifield.F outbc.F outbs.F outgrid.F outint.F outspp.F outwnorm.F peakfri.F phys.F preproc.F readwind.F sbottom.F scosfl.F sdissip.F semean.F sepwisw.F setice.F sinput.F snonlin.F sthq.F stokesdrift.F stresso.F unsetice.F update.F updatewd.F upwspec.F userin.F wamassi.F wamodel.F wamoi.F wamwnd.F wavemdl.F wdirspread.F

module/yowcout.F yowgribhd.F yowintp.F yowpcons.F yowwind.F

Files deleted(WAM):

Alt/Makefile.wam.ibm Makefile.wam.sgi

Sar/Makefile.wam.ibm Makefile.wam.sgi

Wam_oper/Makefile.wam.ibm Makefile.wam.sgi

module/Makefile.wam.ibm

Souhail Boussetta and Gianpaolo Balsamo

A monthly climatology based on 2000-2008 MODIS (Collection 5) Leaf Area Index (LAI) product substitutes the previously fixed LAI (based on a look-up table).

Files modified(IFS):

adiab/cpedia.F90 postphy.F90

cliamte/updclie.F90

dia/wrmlppg.F90

fullpos/hpos.F90 specfitg.F90 wrmlfp.F90 wrmlfpl.F90

module/parfpos.F90 surface_fields_mix.F90 yoephy.F90 yomafn.F90 yomgrb.F90 yommcc.F90

namelist/naephy.h

phys_ec/callpar.F90 callparad.F90 callpartl.F90 ec_phys.F90 ec_phys_ad.F90 ec_phys_tl.F90 radcfg.F90 radpar.F90 suphec.F90

setup/su0phy.F90 su_surf_flds.F90 suafn1.F90 suafn2.F90 suafn3.F90 sumcc.F90

Files modified(PREPDATA):

programs/intsst.F90

Files modified(SCRIPTS):

gen/ansfc fast_sgint getgrb getgrb_vareps getini getpersSST getsst grib_def.h ifstraj inter_fp mkidta mkidta_eps mkidta_ocean mkidta_sens mknam_fp model modeleps smrescale

sms/sfc.sms

Files modified(SURF):

external/surfbc.F90 surfexcdriver.F90 surfexcdrivers.F90 surfexcdriversad.F90 surfexcdriverstl.F90 surftstp.F90 susurf.F90

interface/surfbc.h surfexcdriver.h surfexcdrivers.h surfexcdriversad.h surfexcdriverstl.h surftstp.h susurf.h

module/srfsn_lwexp_mod.F90 (removed) srfsn_lwimp_mod.F90 srfsn_mod.F90 srfsn_rsn_mod.F90 (removed) srfwexc_vg_mod.F90 surfbc_ctl_mod.F90 surfexcdriver_ctl_mod.F90 surfexcdrivers_ctl_mod.F90 surfexcdriversad_ctl_mod.F90 surfexcdriverstl_ctl_mod.F90 surfrad_ctl_mod.F90 surftstp_ctl_mod.F90 sussoil_mod.F90 susurf_ctl_mod.F90 susveg_mod.F90

vsurf_mod.F90 vsurfs_mod.F90 vsurfsad_mod.F90 vsurfstl_mod.F90 yos_soil.F90 yos_veg.F90

offline/driver/callpar1s.F90 cpg1s.F90 rdclim.F90 rdsupr.F90 su0phy1s.F90 sucdfres.F90 sucdh1s.F90 sudcdf.F90 sudim1s.F90 sugdi1s.F90 sugp1s.F90 sugpd1s.F90 suinif1s.F90 suphec.F90 upddiag.F90 wrtdcdf.F90 wrtres.F90

offline/module/ptrgp1s.F90 ptrgpd1s.F90 yoephy.F90 yomcc1s.F90 yomgdi1s.F90 yomgp1s0.F90 yomgp1s1.F90 yomgp1sa.F90 yomgpd1s.F90

offline/namelist/namgpd1s.h namphy1s.h

offline/phys_ec/vdfmain1s.F90

Peter Bechtold

Add temperature tendency due to convective kinetic energy dissipation.

Add convective Scavenging of Tracers under switch LMFSCAV and reorganize Aerosol scavenging part. So far convective scavenging will be active for Aerosols.

Rationalise initialisation of cloudsc.F90 before convection call.

Simplify and remove level dependency in computation of pressure limit of limiter for orographic gravity wave drag tendencies

Files modified(IFS):

module/yoecumf.F90 yoecumf2.F90 yoephy.F90

namelist/naephy.h

phys_ec/aer_phy3.F90 aer_scavin.F90 callpar.F90 callparad.F90 callpartl.F90 cloudsc.F90 cucalln.F90 cucalln2.F90 cucalln2ad.F90 cucalln2tl.F90 cucallnad.F90 cucallntl.F90 cuctracer.F90 cuctracerad.F90 cuctracertl.F90 cumastrn.F90 cumastrn2.F90 cumastrn2ad.F90 cumastrn2tl.F90 cumastrnad.F90 cumastrntl.F90 gems_dealloc.F90 gems_init.F90 grg_tendctm.F90 grg_tendctm.F90 phys_ad.F90 phys_nl.F90 phys_tl.F90 sucumf.F90 sucumf2.F90 sugwd.F90

ifs/setup/su0phy.F90

Peter Bechtold, Iain Russell, Adrian Tompkins:

Upgrade and simplification of physics climate plotting package

Modified routines: The physics climate plotting package has been upgraded and simplified. The code is shortened, optimized and adapted for GRIB_API. Plot quality is improved and, plotting options for statistical significance, black and white plotting, and article style titles under integer NCLIMPL have been added. It also contains new routines to plot diurnal cycle via postprocessing.

Files modified(SCRIPTS):

scripts/metview/climate_obs.met climplot_batch compvar_ens.met monmeans_clim.met monmeans_clim_batch wind_maps_clim.met zondia-seas_def_title zondia_seas_icon_batch.met

scripts/sms/climplot.sms mmeans_ml.sms mmeans_pl.sms mmeans_sfc.sms

Files created(SCRIPTS):

scripts/metview/avgtime.f90 (replaces avgtime.f) ttest_thresh.f90 save_mean_diurnal_flux.met plot_amp_phase_clim.met

Marta Janiskova

TL and AD of non-orographic gravity wave drag

Tangent-linear and adjoint versions of the non-orographic gravity wave drag scheme (used operationally in the forecast model from CY35R3) have been coded. At this stage, the schemes are not activated, so they do not have any impact on operational configurations. They can be activated by setting LEGWWMS2 to true (namelist NAMTRAJP). TL/AD schemes would then be used with the prescribed time frequency GTPHYGWWMS.

Files created(IFS):
`module/yoegwdwms.F90 phys_ec/gwdrag_wmss.F90 gwdrag_wmsstl.F90 gwdrag_wmssad.F90`

Files modified(IFS):
`namelist/namtrajp.h module/yophnc.F90 setup/su0phy.F90 susc2b.F90 sutrajp.F90 utility/rdphtrajt.F90 dealsc2.F90 dia/wrphtrajt.F90 phys_ec/callpar.F90 callpartl.F90 callparad.F90`

Martin Koehler

Adjustment to diffusion in stable layers near the surface to improve T2m night-time cold bias over Europe

It has been documented that winter night-time can reach too cold temperatures particularly over Europe. The currently used combined length scale and stability function transitions near and far from the surface is also not considered optimal. Therefore, both transition functions were separated. For transition from the Louis-Tiedtke-Geleyn stability functions near the surface to Monin-Obukov for above a new exponational law is used with a length scale of 150m. Main impacts are a winter night-time warming of 0.15K over Europe and a 10-30

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

Bill Bell and Alan Geer

Monitoring SSMIS (F16,F17 and F18) and Coriolis-Windsat via *all-sky* stream

This capability enables the monitoring of a new data stream for the existing *SSMIS* instruments (F16, launched October 2003 and F17, launched November 2007) as well as data from *Coriolis Windsat* launched January 2003. Capability has also been enabled for the latest of the SSMIS constellation (F18, launched October 2009) although data is not yet available for this satellite. SSMIS is a microwave imager/sounder providing information on temperature, water vapour, cloud and precipitation and will be processed *via* the *all-sky* route introduced at CY35R2. Windsat is a passive microwave imager and has several fully polarimetric channels (at 10.7, 18.7 and 37.0 GHz) which provide information on ocean surface wind vectors as well as water vapour, cloud and precipitation. Windsat is also processed *via* the *all-sky* route.

In 36R3 Windsat and SSMIS will be passively monitored (blacklist entry set to fail(EXPERIMENTAL)) in readiness for operational activation given the depleted state of the current imager constellation.

Files created(IFS):
`module/varbc_rad_allsky.F90 varbc_table.F90`
`mwave/mwave_diags_errors.F90`

Files created(ODB):

```
bufr2odb/bufr2odb_windsat.F90 bufr2odb_winsat.F90 odb2bufr_dep_156.F90
odb2bufr_fos_156.F90 odb2bufr_qc_156.F90
ddl.ECMA/new_thinn_robody_3.sql
ddl/new_thinn_robody_3.sql varbc_rad_allsky_robhdr.sql varbc_rad_allsky_robody.sql
```

Files created(SATRAD):

```
programs/bufr_screen_windsat.F90 bufr_screen_windsat_1d.F90
```

Files created(SCRIPTS):

```
sms_an/b2o_windsat b2o_windsat.sms o2b_windsat.sms obstat_windsat.sms odbcmp_windsat.sms
```

Files modified(IFS):

```
common/yomdb_defs.h yomdb_vars.h
control/gp_model.F90 gp_model_ad.F90 gp_model_tl.F90
module/mwimager_mix.F90 parmwave.F90 varbc_allsky.F90 varbc_pred.F90
varbc_rad.F90 varbc_setup.F90 yomdb.F90 yomemis.F90 yommwave.F90 yomtvrad.F90
mwave/mwave_get.F90 mwave_get_ad.F90 mwave_get_tl.F90 mwave_igp2obs.F90
mwave_iobs2gp.F90 mwave_nearest.F90 mwave_obs2gp.F90 mwave_obsop.F90
mwave_obsop_ad.F90 mwave_obsop_test.F90 mwave_obsop_tl.F90 mwave_put.F90
mwave_put_tl.F90 mwave_read_sat_error.F90 mwave_screen.F90 mwave_setup.F90
namelist/namemis_conf.h nammwave.h
obs_preproc/black.F90 defrun.F90 gefger.F90 new_thinn.F90 new_thinner.F90
new_thinner_no_sq.F90 post_thinner.F90 pre_thinner.F90
op_obs/hdepart.F90 hop.F90 hopad.F90 hoptl.F90 hretr.F90 hsatang.F90
rad1cemis.F90
phys_ec/ec_phys.F90 ec_phys_ad.F90 ec_phys_drv.F90 ec_phys_tl.F90 ec_physg.F90
vdfmain.F90
setup/suemis_conf.F90
var/getsatid.F90 rtsetup.F90 taskob.F90
```

Files modified(ODB):

```
bufr2odb/bufr2odb_ssmis_1d.F90 get_varindex.F90 odb2bufr_dep_127.F90
cma2odb/buf2cmat_new.F90 ctxinitdb.F90 initmdb.F90 matchupdb.F90 subuoctp.F90
ddl.CCMA/varbc_allsky_robhdr.sql varbc_allsky_robody.sql
ddl.ECMA/varbc_allsky_robhdr.sql varbc_allsky_robody.sql
ddl/cma.h ecmwf_matchup_body.sql map_ssmi_rain_ssmi.sql matchup_body.sql
new_thinn_robhdr_3.sql post_thinn_robhdr_3.sql pre_thinn_robhdr_3.sql robhdr.sql
robhdr_gp_get_ssmi.sql robhdr_gp_put_ssmi.sql robhdr_mwave_get_ssmi.sql
robhdr_mwave_put_ssmi.sql robody.sql robody_gp_get_ssmi.sql
robody_gp_put_ssmi.sql robody_mwave_get_ssmi.sql robody_mwave_put_ssmi.sql
robody_traj.sql sat_ssmi.sql sufger_robhdr_1.sql thinn_robhdr_3.sql
varbc_allsky_robhdr.sql varbc_allsky_robody.sql
module/yomboctp.F90
tools/Bufr2odb.F90 Fbnew2old.F90 Odb2bufr.F90
```

Files modified(SATRAD):

```
module/bufr_grid_screen_keep.F90 gaussgrid.F90 mwave_const.F90
mwave/mwave_get_rtcoeff.F90 mwave_obsop_rttov.F90 mwave_obsop_rttov_ad.F90
```

mwave_obsop_rttov_tl.F90
programs/bufr_grid_screen.F90 bufr_screen_ssmis.F90 bufr_screen_ssmis_1d.F90
rttov/rttov_calcbt_tl.F90 rttov_k.F90 rttov_scatt.F90 rttov_scatt_setupindex.F90

Files modified(SCRIPTS):
def/an.def
gen/bufr2odb fdbksave fetchobs ifsmin ifstraj mergebufr mkabs_reanal
mkabs_satrad mklinks premwimg varconsts vardata
sms_an/premwimg.sms

Files deleted(ODB):
ddl/robhdr_mwave_get_screen_ssmi.sql robhdr_mwave_put_screen_ssmi.sql robody_mwave_-
get_screen_ssmi.sql robody_mwave_put_screen_ssmi.sql

Roberto Buizza

Scripts to use EDA-based perturbations in the EPS

It has been documented (RD-Memo R48.9/RD/1012) that the replacement of the evolved SVs with perturbations generated using an Ensemble Data Assimilation (EDA) system improves the EPS performance. The EDA-based component of the initial perturbations provides a wider geographical and vertical coverage, especially of the areas that were poorly sampled by the singular vectors. In the new EDA-SVINI EPS, the amplitude of the SVINI component has been reduced by 10

Files created(SCRIPTS):
gen/config_dep.h sms/edamemberok.sms checkedamemberok.sms

Files modified(SCRIPTS):
def/eps_varfc.dev gen/getini getmars sms/eda_men.sms getini.sms getiniLeg.sms
inidata.sms pertinic.sms save.sms trans_an.sms wavini.sms sms_oc/ocwavini.sms
wav/wave_getrst

Alan Geer

Revised all-sky QC and obs errors

This change substantially increases the weight of the all-sky observations in the analysis, and results in the analysis drawing closer to the SSM/I and AMSR-E observations. This brings benefits in oceanic lower tropospheric humidity, as evidenced by improved sonde and AMSU-B/MHS fits. An internal memo will be distributed in January 2010 describing this.

- Observation errors are based on a ”symmetric total error” model
- Quality control is done by the ”symmetric” method
- Observations are ”superobbed” to the gaussian equivalent of T255 resolution before assimilation
- Thinning (new_thin) is turned off
- Observations affected by forecast model biases in (i) ”cold sector” cloud and (ii) excess falling snow are removed at the screening stage

- Inland seas and lakes are blacklisted
- fail(experimental) may now be used with all-sky observations

Files created(IFS):

`module/varbc_table.F90`

`mwave/mwave_diags_errors.F90`

Files created(ODB):

`ddl.ECMA/new_thinn_robody_3.sql`

`ddl/new_thinn_robody_3.sql`

Files modified(IFS):

`common/yomdb_defs.h yomdb_vars.h`

`control/gp_model.F90 gp_model_ad.F90 gp_model_tl.F90`

`module/parmwave.F90 varbc_allsky.F90 varbc_pred.F90 varbc_setup.F90 yomdb.F90 yommwave.F90`

`mwave/mwave_get.F90 mwave_get_ad.F90 mwave_get_tl.F90 mwave_igp2obs.F90 mwave_iobs2gp.F90 mwave_nearest.F90 mwave_obs2gp.F90 mwave_obsop.F90 mwave_obsop_ad.F90 mwave_obsop_test.F90 mwave_obsop_tl.F90 mwave_put.F90 mwave_put_tl.F90 mwave_read_sat_error.F90 mwave_screen.F90 mwave_setup.F90`

`namelist/nammwave.h`

`obs_preproc/black.F90 gefger.F90 new_thinn.F90 new_thinner.F90 new_thinner_no_sq.F90 post_thinner.F90 pre_thinner.F90`

`op_obs/hdepart.F90 hop.F90 hopad.F90 hoptl.F90 hretr.F90`

`phys_ec/ec_phys.F90 ec_phys_ad.F90 ec_phys_drv.F90 ec_phys_tl.F90 ec_physg.F90 vdfmain.F90`

`var/taskob.F90`

Files modified(ODB):

`cma2odb/ctxinitdb.F90 initmdb.F90 matchupdb.F90`

`ddl/cma.h ecmwf_matchup_body.sql matchup_body.sql new_thinn_robhdr_3.sql post_thinn_-robhdr_3.sql pre_thinn_robhdr_3.sql robhdr.sql robhdr_mwave_get_ssmi.sql robhdr_-mwave_put_ssmi.sql robody.sql robody_mwave_get_ssmi.sql robody_mwave_put_ssmi.sql robody_traj.sql sufger_robhdr_1.sql thinn_robhdr_3.sql`

Files modified(SATRAD):

`module/bufr_grid_screen_keep.F90 gaussgrid.F90 mwave_const.F90`

`mwave/mwave_get_rtcoeff.F90 mwave_obsop_rttov.F90`

`programs/bufr_grid_screen.F90`

Files modified(SCRIPTS):

`def/an.def`

`gen/ifsmin ifstraj mklinks premwimg vardata`

`sms_an/premwimg.sms`

Files deleted(ODB):

`ddl/robhdr_mwave_get_screen_ssmi.sql robhdr_mwave_put_screen_ssmi.sql robody_mwave_-get_screen_ssmi.sql robody_mwave_put_screen_ssmi.sql`

Alan Geer, Dick Dee

VarBC preconditioning

VarBC is now preconditioned per obgroup, i.e. individually for each satellite channel, rather than globally. This means that channels or instruments with very different geographical coverage will now be more appropriately pre-conditioned.

The VARBC.cycle file version has changed to 5. It is possible to convert version 5 files to version 4 manually, by doing this:

1. Find the first predictor statistics block, e.g.

   ```
   ix=1
   predxcnt= ...
   predmean= ...
   predxcov= ...
   ```

2. Remove all following blocks
3. Remove the "ix=1" line from the first statistics block.

Files created(IFS):
`module/varbc_table.F90`

Files modified(IFS):
`module/varbc_pred.F90 varbc_setup.F90`
`op_obs/hop.F90 hopad.F90 hoptl.F90 hretr.F90`
`var/taskob.F90`

Hans Hersbach

Improved Assimilation of Scatterometer data

- Assimilation of scatterometer data as neutral wind, using an observation operator that is consistent with the model physics.
- Replacement of on-the-fly archiving of neutral wind and friction velocity.
- Account for time-dependencies of the wave Charnock parameter in the minimization, and the usage of forecast surface roughness, rather than climatology, in observation operators.

Up to CY36R2, stability effects in the surface layer as required by the observation operator are estimated from lowest model level fields and surface fields (in routine exchco). This is achieved via an old version of the ECMWF surface parametrisation (Louis 1979). Results appear to be significantly different from the formulation inside the parametrization as currently used in the high-resolution forecast (vdfmain). This discrepancy has inhibited the (more correct) usage of scatterometer data as neutral 10m wind rather than 10m wind.

This branch introduces the calculation of 10m neutral wind in the model (post-processing) routine sppcfl, which is called inside callpar (via vdfmain), and the communication to the observation operator via the GOM-arrays. A new routine exchco_vdf allows for the evaluation of a consistent observation operator for the high-resolution trajectory. In the minimization, the branch also introduces the possibility to correctly transport the information on perturbations in neutral wind, by an appropriate extension of the simplified physics (sppcfls) and corresponding adjoint and tangent-linear (sppcflsad and sppcflstl). This required the proper handling of surface perturbations in the GOM arrays; something that had been prepared many years ago, but sofar had not been pursued. Two new logicals (in yomobs, input via NAMOBS) have been introduced that control the actions to be taken:
LVDFTRAJ determines whether exchco_vdf is to be used (.true.) or not (.false.)
LVDFMIN determines whether perturbations in neutral wind are taken from the model
physics (.true.) or from lowest-level winds (.false.). The script branch will set both to .true. (default in defrun is .false.). In case of non-ECMWF or 3D-FGAT (in which vdfmain is not called), both are reset to .false..

Besides the calculation of 10m neutral wind components, sppcfl now also determines friction velocity. These three parameters will be archived as forecast surface fields (via an extension of fullpos). This should replace their current 'on-the-fly' generation in the operational suite (required by the SMOS community). This will resolve some current shortcomings over areas with strong gradients in orography.

The branch will store the wave Charnock parameter in the full trajectory, rather than the constant one. Also, the forecast-surface roughness (FSR) is passed to observation operators, rather than its climatology (SR). Over water, for instance, the latter is assumed to have the same value as over sea ice (1mm), which is typically one order of magnitude too high.

Files created(IFS):

`control/reset_spert.F90`

`op_obs/exchco_vdf.F90 exchco_vdfad.F90 exchco_vdftl.F90`

Files modified(IFS):

`control/gp_model_tl.F90 scan2m.F90 scan2mad.F90 scan2mtl.F90`

`fullpos/hpos.F90 wrmlfp.F90 wrmlfpl.F90`

`module/goms_mix.F90 parfpos.F90 surface_fields_mix.F90 traj_surface_mod.F90 yomafn.F90 yomgrb.F90 yomobs.F90`

`namelist/namobs.h`

`obs_preproc/defrun.F90`

`op_obs/bgobs.F90 cobs.F90 cobsad.F90 cobslag.F90 cobslagad.F90 cobstl.F90 hop.F90 hopad.F90 hoptl.F90 hretr.F90 mpobseq.F90 mpobseq_pack.F90 mpobseqad.F90 mpobseqad_unpck.F90 obshor.F90 obshorad.F90 preints.F90 preintsad.F90 preintstl.F90 slint.F90 slintad.F90`

`phys_ec/callpar.F90 callparad.F90 callpartl.F90 ec_phys.F90 ec_phys_ad.F90 ec_phys_tl.F90 suphli.F90 vdfmain.F90 vdfmains.F90 vdfmainsad.F90 vdfmainstl.F90 vdfouter.F90`

`setup/modgrin.F90 su_surf_flds.F90 suafn1.F90 suafn2.F90 suafn3.F90 sugridg.F90 supp.F90 susc2b.F90`

Files modified(SCAT):

`programs/qscat25to50km.F`

Files modified(SCRIPTS):

`gen/ansfc getgrb grib_def.h ifsmin ifstraj model`

Files modified(SURF):

external/surfpp.F90 surfpps.F90 surfppsad.F90 surfppstl.F90
interface/surfpp.h surfpps.h surfppsad.h surfppstl.h
module/sppcfl_mod.F90 sppcfls_mod.F90 sppcflsad_mod.F90 sppcflstl_mod.F90 surfpp_-
ctl_mod.F90 surfpps_ctl_mod.F90 surfppsad_ctl_mod.F90 surfppstl_ctl_mod.F90

Bugfix in quality control for ERS-2 data

Prior to the inversion of ERS-2 backscatter to wind, quality checks are performed on data contents and flags. One check is performed on a quantity called 'MISSING PACKET COUNTER'. Data is currently rejected when its absolute value exceeds 10. - this should be 1000. This change in QC leads to a small increase in data usage.

Files modified(IFS):
obs_preproc/iniersca.F90

Martin Leutbecher and Peter Bechtold

New treatment of supersaturation for Stochastically Perturbed Parametrization Tendency scheme

New code has been added to the Stochastically Perturbed Parametrization Tendency scheme (SPPT) in order to permit a new treatment of supersaturation (NQSAT_SDT) and in order to activate perturbation patterns with multiple spatial and temporal scales (NSCALES_SDT). Additional changes are minor corrections (no meteorological impact) and code cleaning.

Files modified(ALGOR):
module/spectral_arp_mod.F90

Files created(IFS):
phys_ec/sppten.F90

Files modified(IFS):
control/reresf.F90 stepo.F90
function/fcttre.h
module/yomspsdt.F90 yomvareps.F90
namelist/namspsdt.h
phys_ec/callpar.F90 stochadiaten.F90
setup/su0yomb.F90 suspsdt.F90 suvareps.F90
utility/dealmod.F90 wrresf.F90

Files modified(SCRIPTS):
gen/modeleps
sms/getvarepsdata.sms

Philippe Lopez

Fix for calculation of spectral coeffs of 'tv' or t

Description of changes:

1. Correction in the handling of the optional argument for increments (switch LDINCR).

2. Use of proper humidity trajectory array (GFL5) in the computation of R (instead of humidity perturbation array, GFL) in the case of increments conversion between temperature and virtual temperature.

Files modified(IFS):

`adiab/specrt.F90`

Qifeng Lu, Niels Bormann, Bill Bell

Monitoring of FY-3A data

The branch allows the monitoring (and possible assimilation) of four new instruments onboard the Chinese FY-3A satellite. The instruments include the Vertical Atmospheric Sounding System (VASS, made up of the Infrared Atmospheric Sounder IRAS, the Microwave Temperature Sounder MWTS, and the Microwave Humidity Sounder MWHS), and the Microwave Radiation Imager (MWRI). The data can be activated through the prepIFS switches LIRAS, LMWHS, LMWTS, LMWIR, and LMWIRRAIN in the Satellites window.

Files created(IFS):

`obs_preproc/iras_cld.F90`

Files created(ODB):

`bufr2odb/bufr2odb_fy3.F90 bufr2odb_mwri_1d.F90`

Files created(SATRAD):

`programs/bufr_screen_mwri.F90 bufr_screen_mwri_1d.F90`

Files created(SCRIPTS):

`sms_an/b2o_iras.sms b2o_mwhs.sms b2o_mwri.sms b2o_mwts.sms obstat_iras.sms obstat_mwhs.sms obstat_mwri.sms obstat_mwts.sms odbcmp_iras.sms odbcmp_mwhs.sms odbcmp_mwri.sms odbcmp_mwts.sms pre1crad_iras.sms pre1crad_mwhs.sms pre1crad_mwts.sms`

`sms_era/obtime_iras.sms obtime_mwhs.sms obtime_mwri.sms obtime_mwts.sms`

Files modified(IFS):

`module/mwimager_mix.F90 parmwave.F90 varbc_allsky.F90 varbc_rad.F90 yomemis.F90 yomtvrad.F90`

`mwave/mwave_obsop.F90 mwave_setup.F90`

`obs_preproc/black.F90 defrun.F90 new_thinn.F90 new_thinner_no_sq.F90 pre_thinner.F90`

`op_obs/cloud_estimate.F90 emis_ir.F90 emis_mw_n.F90 hretr.F90 hsatang.F90 rad1cemis.F90 rad1cobe.F90`

`setup/suemis_conf.F90`

`var/getsatid.F90`

Files modified(ODB):

`cma2odb/buf2cmat_new.F90 subuoctp.F90`

`ddl/robhdr_gp_get_ssmi.sql robhdr_gp_put_ssmi.sql robhdr_mwave_get_screen_ssmi.sql robhdr_mwave_get_ssmi.sql robhdr_mwave_put_screen_ssmi.sql robhdr_mwave_put_ssmi.sql robody_gp_get_ssmi.sql robody_gp_put_ssmi.sql robody_mwave_get_screen_ssmi.sql robody_mwave_get_ssmi.sql robody_mwave_put_screen_ssmi.sql robody_mwave_put_ssmi.sql sat_ssmi.sql sensor.h varbc_allsky_robhdr.sql`

varbc_allsky_robody.sql
module/yomboctp.F90
scripts/bufr2odb
tools/Bufr2odb.F90

Files modified(SATRAD):
module/rttov_const.F90
mwave/mwave_obsop_rttov.F90
programs/screen_1c.F90

Files modified(SCRIPTS):
def/an.def fsobs.def
gen/archive_obs bufr2odb cleanodb fdbksave fetchobs ifstraj mergebufr
mkabs_satrad mklinks pre1crad_screen premwimg varconsts
sms_an/makeodb.sms
sms_era/obtime.sms

Gabor Radnoti

Observation error correlations

The code has been optimized in terms of parallelism. To this end, small modifications have been introduced to the transformation package and its interface to enable switching between mono- and multi-tasking mode spectral transformations within an ifs run. Accounting for observation error correlations is extended to AMSUA data in addition to AMV-s.

Files modified(ALGOR):
external/lanczos/landr.F lanczos/loadev.F
internal/lanczos/ritvec.F

Files modified(IFS):
module/yomcosjo.F90 yomtrans.F90
namelist/namjo.h
obs_preproc/defrun.F90 gen_corr_pert.F90 interp_obs.F90 interp_obsad.F90
obscor_lanczos.F90 opk_obscor.F90 suobscor.F90 suobscor_resol.F90
op_obs/hjo.F90 hop.F90 hoptl.F90 obscor_sumup_scalp.F90
setup/su0yomb.F90 sutrans.F90
sinvect/nalan1.F90
utility/freemem.F90 gstats_label_ifs.F90
var/suhifce.F90 suhifcead.F90

Files modified(ODB):
ddl.CCMA/suobscor_robhdr.sql
ddl/cma.h suobscor_robhdr.sql

Files modified(SCRIPTS):
gen/ifsmin

Files modified(TRANS):
external/setup_trans0.F90 trans_end.F90

interface/trans_end.h
module/ftinv_ctlad_mod.F90

Fix for LANOBS reproducibility and Bug

In BGVECS the background error variances are updated for use in the next 4DVAR cycle. The computations use the gridpoint trajectory values therefore they need to know what is the value of NSTEP. And since it is at "background time" NSTEP=0 should be. When LANOBS is on, an NSTEP=0 statement in BGVECS guarantees it. When LANOBS is off, this statement was not necessary before because at this stage NSTEP=0 was anyway. In recent cycles it is not the case, NSTEP=NSTOP at this stage.

Now LANOBS on and off give the same (correct) results.

Files modified(IFS):
var/bgvecs.F90 xformev.F90

Patricia De Rosnay

Updates in the SEKF surface analysis and in ASCAT CDF matching

Files modified(IFS):
control/csekf2.F90
module/yomsekf.F90
namelist/namsekf.h
obs_preproc/ascatsm_cdfmatch.F90
phys_ec/callpar.F90 restore_surftstp.F90 restore_vdfout.F90 store_surftstp.F90 store_vdfout.F90 vdfdifh.F90 vdfdifm.F90 vdfincr.F90 vdfmain.F90
sekf/sekf_write.F90 sm_ekf_main.F90 susekf.F90

Files modified(SCRIPTS):
def/an.def
gen/ifstraj sekf_sm soilana
wav/wave_setup_4v

Files modified(WAM):
Wam_oper/mpdecomp.F wavemdl.F

Martin Steinheimer and Glenn Shutts

Update to spectral stochastic backscatter scheme (SPBS)

The code for SPBS was updated to the latest version. Changes include:

- Added temperature backscatter (default: LSTOPH_SPBS_T=FALSE)
- Optional *vorticity ansatz* (default: LSTOPH_SPBS_VORT=FALSE). In this option the stream function forcing pattern is converted into a vorticity forcing pattern before multiplication with the dissipation rate.
- SPBS now uses boundary layer tapering (default: LSTOPH_TAPER=TRUE), first time step Markov chain

initialization (default: LSTOPH_INI=TRUE) and random vertical profiles (default: LSTOPH_RVP=TRUE) by default.

- Pressure dependency of vertical correlation scale added to RVP
- Changed functional dependency of stream function forcing from $(1+n)^{-1.27}$ to $n^{-1.27}$, where n is the spherical harmonic degree
- Added restart capability for seasonal runs (includes changes to the restart of the old stochastic tendency scheme)
- Code optimizations to reduce computational cost (option LSTOPH_SPBS_FAST for pattern update only every NFRSTOPH_SPBS time steps, consistent with the call frequency of the spectral transforms (i.e. stream function forcing update frequency)

along with several minor bug fixes.

SPBS is controlled by namelist NAMSTOPH. The main switches are LSTOPH_SPBS to activate stochastic backscatter. SPBS is not used by default, i.e. LSTOPH_SPBS is set to FALSE by default.

Files modified(IFS):
adiab/spchor.F90
control/cnt4.F90 reresf.F90
module/stoph_mix.F90 yomrandom_streams.F90
namelist/namstoph.h
phys_ec/callpar.F90 ec_phys.F90 ec_phys_drv.F90 ec_physg.F90
setup/surand1.F90 surand2.F90
utility/wrresf.F90

Files modified(SCRIPTS):
gen/modeleps

Yuhei Takaya, Jean Bidlot, Anton Beljaars, Peter Janssen

Modifications of the skin layer scheme and a Stokes drift computation

- Optimization of Monin-Obukhov stability function for stable conditions.
- Taking into account the Langmuir circulation effect in ocean mixing
- Online computation of the Stokes drift velocity

Files modified(IFS):
module/surface_fields_mix.F90 yoephy.F90 yoewcou.F90
namelist/naephy.h
phys_ec/callpar.F90 ec_phys.F90 suphec.F90 vdfmain.F90 vdfouter.F90 wvcouple.F90
setup/su0phy.F90 su_surf_flds.F90

Files modified(SCRIPTS):

def/gen.def
eps/ifsnam.eps_fc.h
gen/ifsmin ifstraj mknam_fp model modeleps sekf_sm
oce/model_oceatm

Files modified(SURF):
external/surfpp.F90 susurf.F90
interface/surfpp.h susurf.h
module/surfpp_ctl_mod.F90 susurf_ctl_mod.F90 suvexc_mod.F90 voskin_mod.F90 yos_exc.F90

Files modified(WAM):
Alt/altcol.F
Wam_oper/chief.F stokesdrift.F wavemdl.F

David Tan

Bug-fix for no-balance in stratosphere

Small correction to code introduced in Cy35r3 for gradually switching off balance in the stratosphere: the weights of the balanced and unbalanced components now sum to unity in the transition levels.

Files modified(IFS):
var/cvar3.F90 cvar3ad.F90 cvar3in.F90 cvar3inad.F90

PASSIVE AND TECHNICAL CHANGES

Peter Bauer

Enhanced diagnostics for all-sky assimilation of microwave radiances

Enhanced diagnostics for all-sky assimilation of microwave radiances through calculation of adjoint sensitivities of MWAVE observation operator with respect to radiance perturbations. Calculates gradients with respect to profiles of temperature, moisture, cloud liquid water and ice, cloud cover, precipitation and snow as well as sea-surface temperature and 10m wind speed. Gradients are stored in ODB. Diagnostics aim at better data selection in future.

Files modified(IFS):

`common/yomdb_vars.h`
`control/gp_model.F90`
`module/parmwave.F90 yomdb.F90 yommwave.F90`
`mwave/mwave_put.F90 mwave_screen.F90`
`phys_ec/ec_phys.F90 ec_phys_drv.F90 ec_physg.F90`

Files modified(ODB):

`cma2odb/initmdb.F90`
`ddl/cma.h robhdr.sql robhdr_mwave_get_screen_ssmi.sql robhdr_mwave_get_ssmi.sql robhdr_mwave_put_screen_ssmi.sql robhdr_mwave_put_ssmi.sql`

Niels Bormann, Marco Matricardi

Allow flexible number of RTTOV levels, use of SSIREM IR emissivity in RTTOV and other satellite-related changes

- Allow the use of RTTOV coefficient files with a different number of levels for different satellite/instruments if the RTTOV-internal interpolation is used (which is the default for ECMWF). Now, for example, AIRS and IASI can use more levels than AMSU-A if the appropriate coefficient files are provided. If the IFS-interpolation is used, the number of levels still needs to be 43 for all instruments. For operations for now, all coefficients remain on 43 levels, so the change has no effect.
- Simplification of emis_ir.F90 to avoid hardwiring of SSIREM emissivity coefficients. Now, infrared surface emissivities are calculated in RTTOV. emis_ir.F90 is generic for any IR sensor. The IFS hard-wired coefficients differ from the RTTOV ones, so the results are not the same, but similar.
- Revision of some BUFR-settings in pre-screening program screen_1c.F90 to avoid crashes for large BUFR messages.
- Bugfix in adjoint/k code of RTTOV IR cloud routine.
- Rationalisation of AMV thinning. Now all BUFR subtype 87 winds are thinned together, regardless of the generating centre. This does not change the thinning for the currently used data.

Files modified(IFS):

obs_preproc/new_thinn.F90 new_thinner.F90 new_thinner_no_sq.F90 post_thinner.F90 pre_thinner.F90

op_obs/emis_ir.F90 rad1cemis.F90

var/getsatid.F90 rtsetup.F90

Files modified(ODB):

ddl/new_thinn_robhdr_4.sql new_thinn_robody_4.sql post_thinn_robhdr_4.sql post_thinn_robody_4.sql pre_thinn_robhdr_4.sql pre_thinn_robody_4.sql thinn_robhdr_4.sql thinn_robody_4.sql

Files modified(SATRAD):

programs/gensatim.F90 screen_1c.F90

rttov/phrtsetup.F90 rttov_cldstr_ad.F90 rttov_cldstr_k.F90 rttvi.F90

Paul Burton

Add extra tests to verify/wamverify

This adds extra if tests to verify/wamverify so they don't run if there's not enough data in the operational odb to verify against (eg. running within 10 days of the current date).

Files modified(SCRIPTS):

sms/verify.sms wamverify.sms

Tidy up the memory specification of serial HPC jobs

This tidies up the memory specification of serial HPC jobs - removing hardwired memory specifications from the SMS tasks themselves, and replacing with memory specification via SMS variables in the suite definitions. Also stops some serial jobs which were requesting a parallel node in order to grab larger than default memory - these now go to the serial job node with a correct memory allocation.

Files modified(SCRIPTS):

def/an.def coup.def eps_fc.def eps_varfc.def fc.def fsobs.def gen.def ifs_ctm.def oc.def sens.def wam.def

sens/m1.sms sfml.sms sfpl.sms sfsfc.sms transJ1.sms transJ7.sms transJ9.sms

sms/archivectm.sms clean.sms cleanfc.sms cleanmc.sms cleanvarfc.sms cp_pert.sms datalinks.sms fdblinks.sms flush.sms getae.sms getfcdata.sms geticp.sms getini.sms getiniLeg.sms getpersSST.sms getsst.sms getsvs.sms getvarepsdata.sms ifs.sms libs.sms links.sms logfiles.sms ma_tools.sms mc_tools.sms mkdir_edaeps.sms pertinic.sms prep_couplo4.sms prepdata.sms rain.sms rmfdb.sms rot.sms save.sms setup.sms sfc.sms stagesst.sms subspace.sms svsave.sms temp.sms trans_an.sms user.sms wamabs.sms wambuoycol.sms wamcleanfdb.sms wamobs.sms wamuracol.sms wamwave.sms wamwind.sms wavesave.sms wavfcdata.sms wavini.sms wconst.sms wind.sms

sms_an/addsql.sms aeolus.sms aeolus_auxmet.sms aeolus_l2b.sms aeolus_orbpre.sms af.sms anil.sms anml.sms anpl.sms ansfc.sms anwave.sms b2o_NO_OBSERVATIONS.sms b2otools.sms black.sms changeodb.sms clean_an.sms clean_ws.sms cleanodb.sms cmaobs.sms create_s2o_aeolus_md.sms fdbksave.sms fetcherr.sms fetchmars.sms fetchobs.sms forceinv.sms getoverlap.sms getsmon.sms ifstmerge.sms ifstsave.sms mergebufr.sms mergeodb.sms obsproc.sms.obsolete obstat.sms odbsql.sms odbtools.sms perltools.sms pre1crad_iasi.sms pre1crad_iasi_split.sms pre1crad_screen.sms preaeolus.sms pregeos.sms premwimg.sms preobs.sms

prereo3.sms prescat.sms restartodb.sms sarinv.sms satimbin.sms satimsim.sms satmon.sms satrad.sms scat.sms setoverlap.sms slwet.sms smon.sms smon_airs.sms smon_clean.sms smon_iasi.sms ssaabs.sms ssaana.sms svarch.sms update_psbias.sms update_rstrhbias.sms vardata.sms wamana.sms

sms_era/archive_obs.sms clean_eom.sms fetchERA40obs.sms reanal.sms

sms_oc/check_extendrun.sms checkrestarts.sms cleanocean.sms extendrecodegrib.sms extra_arc.sms extrafields.sms getcouple.sms iniatmos.sms mofc_tools.sms oasis.sms occlean.sms occleanallrestarts.sms occleandirs.sms occleanfdb.sms occleanfdbicp.sms occleanrestarts.sms oceps_save.sms ocfcclean.sms ocflush.sms ocgetpert.sms ocml.sms ocpl.sms ocrot.sms ocsfc.sms ocwavfcdata.sms ocwavini.sms ocwcold.sms prob_archive.sms prob_perc.sms prob_thr.sms savecp.sms saveoce_ic.sms saverestarts.sms sc_tools.sms signi_archive.sms tcyc.sms tcyc_sc.sms tools.sms wmanom.sms wmanom_archive.sms wmem.sms wmem_archive.sms wmem_veps.sms

Mohamed Dahoui

Satmon changes

Monitoring of AMVs from FY-2D and FY-2E recently activated. Include new modes: IRAS, MWTS and MWHS from FY-3A. Update script to reduce the frequency of statistics archiving on ECFS for RD experiments (the archiving will be done at the beginning, every four days and at the end of the period).

Files modified(OBSTAT):

module/mod_sat_create_netcdf.F90 mod_sat_monitor.F90

satmon/sat_add_geo.F90 sat_monitor.F90

Files modified(SCRIPTS):

gen/getsmon satmon_getdat satmon_monitor smon smon_clean smon_def smon_funcs

Anne Fouilloux

Grid based ODB for All-sky data

Optimization required for high-resolution. Any ECMA or CCMA can be re-distributed (distributedb) on the fly. The target pool is given in distribid@hdr and data is re-distributed after odb_open in readoba.F90. Only data having distribtype=1 (default is 0) is re-distributed. It has been applied to all sky data to re-distribute them on the model grid.

Setup routines had to be changed: the ODB databases are open after the grid model is known. LECMWF flag has been used to avoid any problems with Meteo-France.

We now have two CCMAs which means we doubled the number of pools (not the number of processors):

- CCMA.obs containing observations with distribtype=0 (any observation distributed randomnly over the globe).
- CCMA.grid containing observations with distribtype=1 (all-sky data. distribtype@hdr=1). Uses grid_nearest to find the nearest grid-point (was taken from mwave_nearest)

Scripts and prepIFS changes: ODB_WRITE_EMPTY_FILES=2. Any other options are irrelevant for CY36R3. I think we should remove this option from prepIFS as it may lead to errors that may be difficult to diagnose.

Tests show that the best value on the IBM Power6 machine is 32. ODB_IO_FILESIZE=32

Files created(IFS):

```
setup/suleg.F90
```

Files created(ODB):

```
aux/odbi_common.c
cma2odb/distribtype_ssmi_rain.F90 distribute_odb.F90 distributedb.F90
grid_nearest.F90 xchangedatadistdb.F90
ddl.CCMA/adjust_distribid.sql numpool_radar.sql obsdist.sql obsdist_atovs.sql
obsdist_atovs_body.sql obsdist_atovs_pred.sql obsdist_body.sql obsdist_ddrs.sql
obsdist_errstat.sql obsdist_hdr.sql obsdist_hdr2atovs_body.sql
obsdist_hdr2body.sql obsdist_hdr2radar_body.sql obsdist_hdr2reo3_body.sql
obsdist_index.sql obsdist_index2hdr.sql obsdist_limb.sql obsdist_poolno.sql
obsdist_radar.sql obsdist_radar_body.sql obsdist_radar_station.sql
obsdist_reo3.sql obsdist_reo3_body.sql obsdist_sat.sql obsdist_satob.sql
obsdist_ssmi.sql obsdist_update_1.sql obsdist_update_10.sql obsdist_update_2.sql
obsdist_update_3.sql obsdist_update_4.sql obsdist_update_5.sql
obsdist_update_6.sql obsdist_update_7.sql obsdist_update_8.sql
obsdist_update_9.sql obsort_ddrs.sql robhdr_grid_distribute.sql
ddl.ECMA/adjust_distribid.sql distribtype_ssmi_rain.sql obsdist.sql
obsdist_atovs.sql obsdist_atovs_body.sql obsdist_atovs_pred.sql obsdist_body.sql
obsdist_ddrs.sql obsdist_errstat.sql obsdist_hdr.sql obsdist_hdr2atovs_body.sql
obsdist_hdr2body.sql obsdist_hdr2radar_body.sql obsdist_hdr2reo3_body.sql
obsdist_index.sql obsdist_index2hdr.sql obsdist_limb.sql obsdist_poolno.sql
obsdist_radar.sql obsdist_radar_body.sql obsdist_radar_station.sql
obsdist_reo3.sql obsdist_reo3_body.sql obsdist_sat.sql obsdist_satob.sql
obsdist_scatt.sql obsdist_scatt_body.sql obsdist_ssmi.sql obsdist_ssmi_body.sql
obsdist_update_1.sql obsdist_update_10.sql obsdist_update_2.sql
obsdist_update_3.sql obsdist_update_4.sql obsdist_update_5.sql
obsdist_update_6.sql obsdist_update_7.sql obsdist_update_8.sql
obsdist_update_9.sql robhdr_grid_distribute.sql size_hdr.sql
ddl/adjust_distribid.sql distribtype_ssmi_rain.sql obsdist.sql obsdist_atovs.sql
obsdist_atovs_body.sql obsdist_atovs_pred.sql obsdist_body.sql obsdist_ddrs.sql
obsdist_errstat.sql obsdist_hdr.sql obsdist_hdr2atovs_body.sql
obsdist_hdr2body.sql obsdist_hdr2radar_body.sql obsdist_hdr2reo3_body.sql
obsdist_index.sql obsdist_index2hdr.sql obsdist_limb.sql obsdist_poolno.sql
obsdist_radar.sql obsdist_radar_body.sql obsdist_radar_station.sql
obsdist_reo3.sql obsdist_reo3_body.sql obsdist_sat.sql obsdist_satob.sql
obsdist_scatt.sql obsdist_scatt_body.sql obsdist_ssmi.sql obsdist_ssmi_body.sql
obsdist_update_1.sql obsdist_update_10.sql obsdist_update_2.sql
obsdist_update_3.sql obsdist_update_4.sql obsdist_update_5.sql
obsdist_update_6.sql obsdist_update_7.sql obsdist_update_8.sql
obsdist_update_9.sql robhdr_grid_distribute.sql size_hdr.sql
include/odbi_cs.h odbi_direct.h
interface/distribtype_ssmi_rain.h distribute_odb.h distributedb.h grid_nearest.h
xchangedatadistdb.h
scripts/use/odb/ibm_power4/use_odb use/odb/ibm_power4/use_odb.sh
use/odb/linux/use_odb use/odb/linux/use_odb.sh use/odb/rs6000/use_odb
use/odb/rs6000/use_odb.sh use/sh.odbnew use/use.odbnew use/use_odb
use/use_odb.sh
```

tools/Adjust_distribid.F90 Create_odb.F90

Files modified(IFS):

common/yomdb_defs.h yomdb_vars.h

mwave/mwave_get.F90 mwave_get_ad.F90 mwave_get_tl.F90 mwave_put.F90 mwave_put_tl.F90

obs_preproc/readoba.F90

op_obs/hdepart.F90 hop.F90 hopad.F90 hoptl.F90 obsvtl.F90

setup/su0yoma.F90 su0yomb.F90 suallo.F90 sudim1.F90 sugem.F90

var/sujb.F90

Files modified(ODB):

aux/odbdump.c odbi_client.c odbi_direct.c odbi_shared.c result.c

cma2odb/ctxinitdb.F90 getdb.F90 initddrs.F90 initmdb.F90 putatdb.F90 revmatchupdb.F90 shuffle_odb.F90 tslotindex.F90 update_ddr_odb.F90 update_obsdb.F90

ddl/cma.h mobhdr_obsort.sql robhdr.sql robhdr_mwave_get_screen_ssmi.sql robhdr_mwave_get_ssmi.sql robhdr_mwave_put_screen_ssmi.sql robhdr_mwave_put_ssmi.sql robhdr_obsort.sql robody.sql robody_mwave_get_screen_ssmi.sql robody_mwave_get_ssmi.sql sat_ssmi.sql smon_mwimg_allsky.sql

include/fodb.h fodbmp2.h odbi.h privpub.h result.h

interface/update_obsdb.h

lib/cread_iomap.c msgpass_obsdata.F90 version.c

scripts/drhook_ex.ksh make.amd64 make.ibm_power4 make.ibm_power6 make.linux_O2 make.rs6000 make_depend make_tarball make_tarball_drhook odbcs.conf

tools/dcagen.c odbdump_main.c odbi_client_main.c odbi_direct_main.c

Files modified(SCRIPTS):

build/Makefile.root.odbport

def/an.def gen.def

gen/fdbksave ifsmin ifstraj matchup mergeodb mkabs_b2otools mkabs_odbtools mkabs_satrad odb_compress odbshuffle revmatchup

sms_an/revmatchup.sms

Files modified(WAM):

Wam_oper/create_wam_bathymetry.F preproc.F

Matchup/Revmatchup performed in the last trajectory

Matchup and Revmatchup sms tasks were both removed. Matchup of sink variables were performed before the last trajectory (outside IFS) and for optimisation purpose it has been included in IFS (call made from readoba.F90). Matchup of other tables (updates and flags in hdr/body) are also performed in the last trajectory. This is only valid if ECMA is used in the last trajectory (ECMWF default).

Revmatchup is now performed at the end of the last trajectory (writeoba).

To activate these changes two new environment variables have to be set: ODB_MATCHUP_DIRECT=1 ODB_-REVMATCHUP_DIRECT=1

Creation of a MONDB (monitoring Database for active data) and changes in archiving of ODBs in ECFS

CCMA is now made of two databases CCMA.obs and CCMA.grid. For archiving and monitoring (alarm sys-

tem, obstat off-line, future MARS archiving of ODBs) purposes we created a new small database (created on demand after the last trajectory) which contains active data only (status.active@hdr=1 and status.active@body=1).

The creation of MONDB should be activated by default, (ODBSAVE_MONDB should be turned to 1/true). MONDB contains a minimum set of ODB columns (allows a simple offline obstat, not instrument based).

The creation of ODBCMP databases should be turned off (ODBSAVE_ODBCMP=false/0) by default for all RD experiments and off for operation.

The archiving of CCMA in ecfs should be off by default (ODBSAVE_CCMA=false/0) for both RD experiments and operation. (note that now we archive both CCMA.grid and CCMA.obs ; users need to retrieve these two ODBs and merge them if necessary; this is why it is recommended to retrieve MONDB instead)

The archiving of ECMA in ecfs should be turned off by default (ODBSAVE_ECMA=false/0) for RD experiments. It should be archived by default in operation (ODBSAVE_ECMA=true/1)

For RD experiments, we now offer the possiblity to archive a specific (instrument based) ECMA or ODBCMP (instead of archiving all of them). New prepIFS variables have to be defined (fdbksave and odb_compress to be changed accordingly), one for each database type (ODBCMP/ECMA) and each observation group (conv, ssmi, reo3, etc...).

ODBSAVE_ODBCMP_conv set to true/1 to archive ODBCMP.conv ODBSAVE_ODBCMP_ssmi set to true/1 to archive ODBCMP.ssmi, etc.

Same of ECMAs (ODBSAVE_ECMA_conv, ODBSAVE_ECMA_ssmi, etc.).

Anne Fouilloux and John Hague

Optimisation of ODB MPI Communications

- Change I/O mapping i.e. make_iopej in msgpass_data (activated only if ODB_WRITE_EMPTY_FILES=2) Better distribution of I/O pools among available MPI processors: this is particularly meaningful in the first trajectory when IFS uses a merged ECMA.
- Change MPI communications in msgpass_data. Uses now asynchronous MPI communication with a local buffer when loading/writing an ODB from/to disk.

Alan Geer

LORES diagnostic from the minimisation

The departure calculated by the TL model at the end of the inner-loop minimisation is now stored in the ODB in

```
LORES@UPDATE_1,2,3
```

Other uses of the ”updates” table have been rationalised.

Files modified(IFS):

```
op_obs/hdepart.F90 hretr.F90
```

Iliana Genkova, Niels Bormann

Additional diagnostics for AMVs in the ODB; new experimental boxcar observation operator for AMVs

- Added three diagnostic variables to the ODB satob table, read from the BUFR data: height_assignment_method@satob, tracer_correlation_method@satob, land_sea@satob
- Activated the calculation of additional FG-based diagnostics for AMVs, stored in the ODB (e.g., p_best@satob, shear@satob, etc).
- Implemented a new experimental observation operator for AMVs, based on layer averaging using a boxcar weighting function. This is still passive for now.
- The ODB code has been cleaned from lines related to BoM use of the code.

Files created(IFS):

`op_obs/meanuv_averagetl.F90 meanuv_weightsad.F90 meanuv_weightstl.F90`

Files modified(IFS):

`common/yomdb_defs.h yomdb_vars.h`
`module/yomtvrad.F90`
`op_obs/amv_get_preds.F90 amv_reassign.F90 hop.F90 hopad.F90 hoptl.F90 hretr.F90 meanuv_averagead.F90 meanuv_weights.F90`
`var/suamv.F90`

Files modified(ODB):

`bufr2odb/bufr2odb_satob.F90 get_varindex.F90`
`cma2odb/initmdb.F90`
`ddl/cma.h varno.h`
`module/getval_module.F90 varindex_module.F90`

Files modified(SCRIPTS):

`def/an.def`
`gen/vardata`

Files modified(WAM):

`Wam_oper/create_wam_bathymetry.F preproc.F`

John Hague and Enrico Fucile

Files modified(IFS):

`module/iostream_mix.F90`

Fix for Memory Leak in Forecast

Jan Haseler

Back-fixes to CY36R2

1. Create type=an fields from type=4v fields if data assimilation fails due to instabilities in the tangent linear model at the top of the atmosphere.
2. Fix for uninitialised data in VARBC computation.
3. Test if arrays have already been allocated in microwave computations.
4. Memory-saving changes
5. Satellite monitoring updates
6. Fix for BUFR processing in satellite pre-screening
7. OpenMP for surface analysis
8. Updates from MetApps

Files created(SCRIPTS):

`gen/restart_999`

`sms_an/restart_999.sms`

Files modified(IFS):

`module/varbc_pred.F90 yomct0.F90`

`mwave/mwave_get_ad.F90 mwave_get_tl.F90 mwave_nearest.F90 mwave_put_tl.F90`

`op_obs/hretr.F90`

`utility/deallo.F90`

`var/evcost.F90`

Files modified(OBSTAT):

`module/mod_sat_create_netcdf.F90 mod_sat_monitor.F90`

`satmon/sat_add_geo.F90 sat_monitor.F90`

Files modified(SATRAD):

`programs/screen_1c.F90`

Files modified(SCRIPTS):

`def/an.def eps_varfc.def fsobs.def gen.def`

`gen/fetchobs forceinv2clim getini getmars getsmon grib_def.h ifsvar mkabs_aeolus modeleps satmon_getdat satmon_monitor smon smon_clean smon_def smon_funcs ssaana vardata`

`oce/storm`

`sms/ml.sms pertinic.sms pl.sms sfc.sms`

`sms_an/clean_an.sms ssaana.sms`

`sms_oc/mofc_tools.sms prob_perc.sms`

Files modified(SSA):

`sub/cres_fill1.F90 sub_prep_nes.F90`

Files modified(WAM):

`module/yowgribhd.F`

Files deleted(SSA):

`sub/lsm_check.F90`

Force leaf-area index fields to climatology at end of analysis

Files modified(PREPDATA):

`programs/forceinv.F90`

Files modified(SCRIPTS):

`gen/forceinv2clim getgrb getini`

Changes to scripts

Files created(SCRIPTS):

`build/Makefile.root.oasis3`

`def/longrange.def`

`gen/MONDB.ddl presmos restart_999`

`metview/ttest_thresh.f90`

`oce/model_nemoIFS ninosst_atmgrid`

`sms/wamcurrent.sms`

`sms_an/b2o_iras.sms b2o_mwhs.sms b2o_mwri.sms b2o_mwts.sms b2o_smos.sms b2o_windsat.sms mondb_ccma.sms mondb_prepare.sms o2b_windsat.sms obstat_iras.sms obstat_mwhs.sms obstat_mwri.sms obstat_mwts.sms obstat_smos.sms obstat_windsat.sms odb_mondb.sms odbcmp_iras.sms odbcmp_mwhs.sms odbcmp_mwri.sms odbcmp_mwts.sms odbcmp_smos.sms odbcmp_windsat.sms pgeomaps_mhs.sms phovmoeller_mhs.sms pre1crad_iras.sms pre1crad_mwhs.sms pre1crad_mwts.sms presmos.sms pscatter_mhs.sms restart_999.sms`

`sms_era/obtime_iras.sms obtime_mwhs.sms obtime_mwri.sms obtime_mwts.sms obtime_windsat.sms`

`sms_oc/build_seasplot.sms clean_longrange.sms cleanfdb_longrange.sms cpmodel_nemo.sms dummy.sms nino_sst.sms`

`wav/wave_getcurrent`

Files modified(SCRIPTS):

`build/Makefile.root.odbport arch/Makefile.in.ibm_power6 arch/Makefile.in.linux`

`def/an.def coup.def eps_fc.def eps_varfc.def fc.def fsobs.def gen.def ifs_ctm.def oc.def sens.def wam.def`

`gen/anml anpl ansfc archive_obs bufr2odb cleanodb create_ioassign fast_sgint fdbksave fetchobs forceinv2clim getgrb getgrb_vareps getini getmars getpersSST getsmon getsst grib_def.h ifsmin ifstmerge ifstraj ifsvar inter_fp libsgen matchup mergebufr mergeodb mkabs_aeolus mkabs_an mkabs_b2otools mkabs_fc mkabs_mctools mkabs_odbtools mkabs_satrad mkidta mkidta_eps mkidta_ocean mkidta_sens mklinks mknam_fp model modeleps obstat odb_compress odbshuffle pre1crad_screen premwimg revmatchup satmon_getdat satmon_monitor sekf_sm smon smon_clean smon_def smon_funcs smrescale ssaana varconsts vardata`

`metview/climate_obs.met climplot_batch compvar_ens.met wind_maps_clim.met zondia-seas_def_title zondia_seas_icon_batch.met`

`oce/archive_ml archive_sfc archive_ua checkrestarts chunk.h extrafields_create mm_archive_sfc mm_archive_ua mm_create_sfc mm_create_ua model_oceatm ninoatmos ninosst saverestarts storm`

`sens/m1.sms sfml.sms sfpl.sms sfsfc.sms transJ1.sms transJ7.sms transJ9.sms`

`sms/archivectm.sms cancel.sms clean.sms cleanfc.sms cleanmc.sms cleanvarfc.sms climplot.sms cp_pert.sms datalinks.sms fdblinks.sms flush.sms getae.sms getfcdata.sms geticp.sms getini.sms getiniLeg.sms getpersSST.sms getsst.sms getsvs.sms getvarepsdata.sms ifs.sms inidata.sms libs.sms links.sms logfiles.sms ma_tools.sms mc_tools.sms mkdir_edaeps.sms ml.sms pertinic.sms pl.sms`

```
prep_couplo4.sms prepdata.sms rain.sms rmfdb.sms rot.sms save.sms setup.sms
sfc.sms stagesst.sms subspace.sms svsave.sms temp.sms trans_an.sms user.sms
wamabs.sms wamarchive.sms wambuoycol.sms wamcleanfdb.sms wamobs.sms
wamuracol.sms wamwave.sms wamwind.sms wavesave.sms wavfcdata.sms wavini.sms
wconst.sms wind.sms
sms_an/addsql.sms aeolus.sms aeolus_auxmet.sms aeolus_l2b.sms aeolus_orbpre.sms
af.sms anil.sms anml.sms anpl.sms ansfc.sms anwave.sms b2o_NO_OBSERVATIONS.sms
b2o_meris.sms b2o_reo3ak.sms b2otools.sms biassave.sms black.sms changeodb.sms
clean_an.sms clean_ws.sms cleanodb.sms cmaobs.sms create_s2o_aeolus_md.sms
fdbksave.sms fetcherr.sms fetchmars.sms fetchobs.sms forceinv.sms
geomaps_mhs.sms geomaps_reo3.sms getoverlap.sms getsmon.sms hovmoeller_mhs.sms
hovmoeller_reo3.sms ifstmerge.sms ifstsave.sms makeodb.sms mergebufr.sms
mergeodb.sms obsproc.sms.obsolete obstat.sms odb_compress.sms odbsql.sms
odbtools.sms perltools.sms pgeomaps_reo3.sms phovmoeller_reo3.sms pobstat.sms
pre1crad_iasi.sms pre1crad_screen.sms preaeolus.sms pregeos.sms premwimg.sms
preobs.sms prereo3.sms prescat.sms pscatter_reo3.sms restartodb.sms
revmatchup.sms sarinv.sms satimbin.sms satimsim.sms satmon.sms satrad.sms
scat.sms scatter_mhs.sms scatter_reo3.sms setoverlap.sms slwet.sms smon.sms
smon_airs.sms smon_clean.sms smon_iasi.sms ssaabs.sms ssaana.sms svarch.sms
update_psbias.sms update_rstrhbias.sms vardata.sms wamana.sms
sms_era/archive_obs.sms clean_eom.sms fetchERA40obs.sms obtime.sms
obtime_meris.sms reanal.sms
sms_oc/check_extendrun.sms checkrestarts.sms cleanocean.sms extendrecodegrib.sms
extra_arc.sms extrafields.sms getcouple.sms iniatmos.sms mofc_tools.sms
oasis.sms occlean.sms occleanallrestarts.sms occleandirs.sms occleanfdb.sms
occleanfdbicp.sms occleanrestarts.sms oceps_save.sms ocfcclean.sms ocflush.sms
ocgetpert.sms ocml.sms ocpl.sms ocrot.sms ocsfc.sms ocwavfcdata.sms ocwavini.sms
ocwcold.sms prob_archive.sms prob_perc.sms prob_thr.sms savecp.sms
saveoce_ic.sms saverestarts.sms sc_tools.sms signi_archive.sms tcyc.sms
tcyc_sc.sms tools.sms wmanom.sms wmanom_archive.sms wmem.sms wmem_archive.sms
wmem_veps.sms
wav/prep_wave wam_input wave_getalt wave_getrst wave_getwind wave_run wave_setgflag
wave_setup wave_setup_4v
```

These have come from the following contributors: Yannick Tremolet, Peter Bechtold, Tim Stockdale, Martin Leutbecher, Hans Hersbach, MetApps, Paul Burton, Joaquin Munoz Sabater, Alan Geer, Jan Haseler, Patricia de Rosnay, Jean Bidlot, Philippe Lopez, Nils Wedi, Gabor Radnoti, David Tan, Martin Steinhamer, Lars Isaksen, Gianpaolo Balsamo, Carla Cardinali, Tomas Wilhelmsson, Roberto Buizza

Elias Holm

Fix the writing out of characters in raw file format

Correct the write out of characters in raw file format (e.g. wavelet Jb) in io_put (within iostream_mix.F90) from

```
CALL WRITE_RECORD(YD,YDR,IKRD(2,2),CDREC=CDR)
```

to the correct

```
CALL WRITE_RECORD(YD,YDR,1,CDREC=CDR)
```

This change has no effect except when IFS writes out files in raw format, e.g. when generating wavelet jb files.

Files modified(IFS:

`module/iostream_mix.F90`

Fatima Karbou

Enable the estimation and use of land surface emissivity for cloudy/rainy situations within all-sky 4D-Var microwave data assimilation

Files modified(IFS):

`mwave/mwave_screen.F90 mwave_obsop.F90 mwave_obsop_ad.F90 mwave_obsop_tl.F90 mwave_obsop_test.F90 mwave_setup.F90 mwave_put.F90 module/yommwave.F90 namelist/nammwave.h control/gp_model.F90 gp_model_ad.F90 gp_model_tl.F90 phys_ec/ec_phys_drv.F90 ec_phys.F90 ec_physg.F90 ec_phys_ad.F90 ec_phys_tl.F90`

Files modified(SATRAD):

`module/rttov_types.F90 rttov/rttov_alloc_rad.F90 mwave/mwave_obsop_rttov.F90 mwave_obsop_rttov_ad.F90 mwave_obsop_rttov_adtest.F90 mwave_obsop_rttov_tl.F90`

Files created(IFS):

`mwave/mwave_emis.F90`

Files created(SATRAD):

`mwave/mwave_emis_rttov.F90 rttov/rttov_emis.F90 rttov_direct_ee.F90 rttov_integrate_ee.F90`

Files modified(ODB):

`ddl/cma.h cma2odb/initmdb.F90 common/yomdb_defs.h yomdb_vars.h ddl/robody_mwave_put_screen_ssmi.sql robody_mwave_get_screen_ssmi.sql`

Martin Leutbecher

Scripts for singular vector computation

The scripts for the singular vector computation and the creation of initial perturbations have been cleaned and new options have been introduced. New high-level SMS variables that control the scripts are: EPSMODE (can be one EPS or EuroTEPS), SVMODE (can be EPS, EuroTEPS, TL), TLMODE (can be buizza, vdiff, moist), SVREGION (can be et, europe, tc, global). The problematic dependence of script modelsv on the name of the TASK has been removed. The linear combination of singular vectors with sv_lin_combi can now be performed for batches of members to save memory. Recommended for singular vectors with resolution exceeding TL95. This is less efficient in terms of CPU time as each singular vector has to be read again for each batch.

Files modified(PREPDATA):

`mc_tools/sv_lin_combi.F90`

Files created(SCRIPTS):

`def/test_sv.def`

`gen/sv_def.h`

`sms/icsave.sms`

Files modified(SCRIPTS):

def/eps_fc.def eps_sv.def eps_varfc.def gen.def
gen/config_dep.h getdata mkidta_eps model modelsv sample_svs
sms/getae.sms getsvs.sms subspace.sms sv.sms svsave.sms targets.sms

Files deleted(SCRIPTS):

sms_oc/sv1.sms sv2.sms sv3.sms sv4.sms sv5.sms sv6.sms svnh.sms svsh.sms

Dingmin Li

Mode based variational bias correction

Implementation of mode based variational bias correction of observations from microwave and infrared sounders.

The code changes involve modifying relevant code in op_obs/ and activating switches in varbc code that is controlled by namelist of NAMVARBC_RAD in scripts/gen/ifstraj and ifsmin.

Files modified(IFS):

op_obs/hop.F90 hoptl.F90 hopad.F90

Jean-Jacques Morcrette

Computation of clear and total sky direct solar radiation

Computation of clear and total sky direct solar radiation and post-processing of the clear-sky and total sky direct fluxes as two new variables archived in Table 228

```
21  FDIR  total sky direct solar radiation at surface   W m-2 s
22  CDIR  clear-sky direct solar radiation at surface   W m-2 s
```

No impact on the analysis/forecast

Files modified(IFS):

adiab/cpedia.F90 postphy.F90
control/reresf.F90
dia/sunddh.F90
fullpos/hpos.F90
module/parfpos.F90 surface_fields_mix.F90 yoeaeratm.F90 yomafn.F90 yomgrb.F90 yomradf.F90
namelist/namafn.h
phys_ec/aer_clcld.F90 callpar.F90 ec_phys.F90 ec_phys_drv.F90 ec_physg.F90 radcbdy.F90 radclb.F90 raddrv.F90 radheatn.F90 radint.F90 radintg.F90 radlswr.F90 su_aerw.F90
phys_radi/srtm_spcvrt_mcica.F90 srtm_srtm_224gp_mcica.F90 suecrad.F90
setup/su_surf_flds.F90 suafn1.F90 suafn2.F90 suafn3.F90 supp.F90
utility/deallo.F90 dealmod.F90 wrresf.F90

George Mozdzynski

RAPS11 fixes

- Changes for T2047
- A trivial fix to support 4 digit spectral resolutions for ref_* and res_* files used for benchmarking (when either LREFGEN=T or LREFOUT=T)

Files modified(IFS):
`dia/spnorm.F90 phys_ec/vdffblend.F90`

Files modified(WAM):
`Wam_oper/intpol.F readwind.F module/yowgribhd.F`

Joaquin Munoz Sabater

Create infrastructure for monitoring of SMOS

- Project ODB: SMOS table definitions, Bufr2odb conversion, SMOS SQL requests,
- Project SATRAD: pre-screening of SMOS data,
- Project IFS: SMOS data from obs to grid-point space (independently for each polarisation) and back to obs space,
- Project SCRIPTS: Add task for SMOS.

Files created(IFS):
`module/parsmos.F90 yomsmos.F90`
`smos/smos_gp2obs.F90 smos_igp2obs.F90 smos_iobs2gp.F90 smos_nearest.F90 smos_obs2gp.F90 smos_obsop.F90 smos_process.F90 smos_screen.F90 smos_update.F90`

Files created(ODB):
`bufr2odb/bufr2odb_smos.F90`
`ddl.ECMA/robhdr_mwave_count_smos.sql robhdr_mwave_process_smos.sql robhdr_mwave_update_smos.sql robody_mwave_process_smos.sql robody_mwave_update_smos.sql`
`ddl/robhdr_mwave_count_smos.sql robhdr_mwave_process_smos.sql robhdr_mwave_update_smos.sql robody_mwave_process_smos.sql robody_mwave_update_smos.sql`

Files created(SATRAD):
`programs/bufr_screen_smos.F90`

Files created(SCRIPTS):
`gen/presmos`
`sms_an/b2o_smos.sms obstat_smos.sms odbcmp_smos.sms presmos.sms`
`sms_era/obtime_smos.sms`

Files modified(IFS):

common/yomdb_defs.h yomdb_vars.h
control/gp_model.F90
module/pardimo.F90 yoephy.F90 yomcoctp.F90 yomtvrad.F90
obs_preproc/obatabs.F90
phys_ec/callpar.F90 ec_phys.F90 ec_phys_drv.F90 ec_physg.F90
setup/cmoctmap.F90 sucmoctp.F90 suvnmb.F90

Files modified(ODB):

bufr2odb/get_varindex.F90
cma2odb/buf2cmat_new.F90 ctxinitdb.F90 getdb.F90 initddrs.F90 initmdb.F90 putatdb.F90 subuoctp.F90
ddl/cma.h varno.h
module/getval_module.F90 varindex_module.F90 yomboctp.F90
scripts/create_ioassign
tools/Bufr2odb.F90

Files modified(SCRIPTS):

def/an.def
gen/bufr2odb create_ioassign fdbksave fetchobs mkabs_satrad
sms_era/obtime.sms

Files modified(WAM):

Wam_oper/create_wam_bathymetry.F preproc.F

Deborah Salmond

OpenMP ORDERED region to enable bit-reproducibility for statistics for predictors

Files modified

modeul/varbc_pred.F90

Tim Stockdale

IFS coupled to the NEMO ocean model using OASIS3

Changes needed to run the IFS coupled to the NEMO ocean model using OASIS3. Use of OASIS3 is controlled via environment variable "OASIS3", which avoids conflicts with the use of OASIS4 by MACC.

Also included are changes which allow greater control over stratospheric settings in the IFS, ie namelist control over parts of orographic gravity wave drag, non-orographic gravity wave drag and Rayleigh friction. In all cases the default values are identical to the previous hard-coded values.

The scripts also contain many enhancements from the ongoing development of the IFS/NEMO coupled system in type long-range.

Files created(IFS):

namelist/namgwd.h namgwwms.h

Files created(OASIS3):

endoasis3.F90 getoasis3.F90 inioasis3.F90 putoasis3.F90 setoasis3.F90 yomoasis3.F90

Files created(SCRIPTS):
build/Makefile.root.oasis3
def/longrange.def
oce/model_nemoIFS ninosst_atmgrid
sms_oc/build_seasplot.sms clean_longrange.sms cleanfdb_longrange.sms cpmodel_nemo.sms dummy.sms nino_sst.sms

Files modified(IFS):
climate/updclie.F90
control/cnt3.F90 cnt4.F90
module/yomdyn.F90
namelist/namdyn.h
phys_ec/gwdrag_wms.F90 radlswr.F90 stochadiaten.F90 sugwd.F90 sugwwms.F90
prism/couplo4_inimpi.F90
programs/master.F90
setup/su0phy.F90 sudyn.F90 sumcc.F90 surayfric.F90
utility/updtim.F90

Files modified(SCRIPTS):
build/arch/Makefile.in.linux
def/gen.def
gen/mkabs_fc mkidta_ocean mknam_fp model sample_svs
oce/archive_ml archive_sfc archive_ua checkrestarts chunk.h extrafields_create mm_archive_sfc mm_archive_ua mm_create_sfc mm_create_ua model_oceatm ninoatmos ninosst saverestarts storm
sms/cancel.sms geticp.sms inidata.sms logfiles.sms
sms_oc/checkrestarts.sms extrafields.sms iniatmos.sms ocflush.sms ocrot.sms ocwavini.sms sc_tools.sms tcyc.sms
wav/prep_wave wave_getrst wave_setup

Yuhei Takaya

Modifications of the ocean mixed layer model (KPP)

- Composition of geostrophic flow.
- Bug fix for coupling on sea-ice grid, limit for diffusivity.

Files modified(IFS):
climate/updclie.F90
fullpos/wrmlfp.F90
module/surface_fields_mix.F90 yomgrb.F90
phys_ec/callpar.F90 ec_phys.F90
setup/su_surf_flds.F90 sugrido.F90

Files modified(SURF):

`external/surftstp.F90`

`interface/surftstp.h`

`module/kpp_blmix_mod.F90 kpp_kppmix_mod.F90 kpp_swfrac_mod.F90 ocean_ml_driver_mod.F90 surftstp_ctl_mod.F90 susocean_ml_mod.F90 yos_ocean_ml.F90`

David Tan

Single observation assimilation experiments

Scripts modifications to enable single observation assimilation experiments - no meteorological impact otherwise. Usage details will be provided in an update of RD memo R43.12/YT/0521.

Files modified(SCRIPTS):

`def/an.def`

`gen/anml anpl ansfc fdbksave ifsmin mergeodb`

Yannick Tremolet

Cleaning of the model error code

Files created(IFS):

`var/djbdy.F90 djcdy.F90`

Files modified(IFS):

`control/cdsta.F90 cnt4.F90 cnt4ad.F90 cnt4tl.F90 cva2.F90 forecast_error.F90 sim4d.F90`

`dfi/digfil.F90 sualldfi.F90 sudfi.F90`

`module/testvar_mix.F90 yomcosjo.F90 yomjcdfi.F90 yomjg.F90 yommodel_error.F90 yomvar.F90`

`namelist/namjg.h namvar.h`

`op_obs/hdepart.F90 hopad.F90`

`utility/addbgs.F90 addfgs.F90 dealctv.F90 savmoderr.F90 sbsbgs.F90 sbsfgs.F90`

`var/bgvecs.F90 evjcdfi.F90 preppcm.F90 sualctv.F90 sujb.F90 sujqcor.F90 sumoderr.F90 suvar.F90 suvazx.F90 xformev.F90`

Files modified(SCRIPTS):

`def/an.def`

`gen/fdbksave ifsmin ifstmerge ifstraj model`

Files deleted(IFS):

`control/adjobsens.F90`

Nils Wedi

Changes to allow running of T2047 and T3999

- changes to trans and ifs to pass the radius of the Earth as a flexible parameter to the transform package and add another option for the Held-Suarez setup, prescribing an initial temperature distribution as if at the pole. (N3DINI=7)
- prepare for running a T3999
  i) defining a diffusion parameter.
  ii) allow to run fullpos interpolation with NPRTRV<>1, which saves memory (now default)
  iii) scripts changes
- prepdata changes that allow to create T2047 and T3999 climate surface files, clean-up of the procedures to create the climate surface files for all resolutions within a single SMS suite (climate_data.def), and adding corresponding tasks and scripts which use the new grib_api.
- bugfix for NH in specfitg.F90 with new grib_api.

Files modified(TRANS):
`external/setup_trans0.F90`
`module/tpm_constants.F90`

Files modified(IFS):
`fullpos/specfitg.F90 setup/suhdir.F90 sutrans.F90 suspecg2.F90`

Tomas Wilhelmsson

Optimisation of Snow analysis

Parallelisation using OpenMP for snow analysis.

Files modified(SSA):
`ssa/sub/cres_fill1.F90 ssa/sub/lsm_check.F90`

Files modified(SCRIPTS):
`sms_an/ssaana.sms`

4D-Var bit-reproducible when changing number of MPI Tasks under LREPRO4DVAR

Files modified(IFS):
`setup/sulun.F90 module/varbc_setup.F90 varbc_eval.F90 varbc_pred.F90 yomlun.F90`
`control_vectors_comm_mod.F90 obs_preproc/mkglobstab.F90 var/cvarbcad.F90`
`cvarbcinadF90 taskob.F90 taskobad.F90`

Agathe Untch

Settings of VMAX for more than 91 levels

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