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:	March 21, 2014	File: RD14-114
Subject:	**IFS Memorandum Cycle CY40R2**	

Cycle 40r2 was created in March 2014. This is a technical cycle which will be merged with CY40T1 from Meteo-France to make CY41. The cycles contains modifications to run on Cray, latest OOPS-IFS encapsulations and many Satellite contributions ready to be enabled in CY40R3 and also RTTOV-11.

Contributors:

Fabrizio Baordo, Niels Bormann, Paul Burton, Glenn Carver, Andrew Collard, Richard Engelen, Alan Geer, John Hague, Mats Hamrud, Masahiro Kazumori, Heather Lawrence, Peter Lean, Cristina Lupu, Sylvie Malardel, Gabor Radnoti, Deborah Salmond, Peter Towers, Filip Vana, Tomas Wilhelmsson, Karim Yessad

DYNAMICS

Sylvie Malardel and Karim Yessad - das_SB40R1_Sylvie - BR

Improve flexibility of LSETTLS

Files modified(IFS):

`adiab/lapinea.F90 lapinea5.F90 lapineaad.F90 lapineatl.F90 larmes.F90 larmes5.F90 larmesad.F90 larmestl.F90 latte_bbc.F90 lattes.F90 lattesad.F90 lattestl.F90 lattex.F90 lattex_dnt.F90 lattex_dnt_ad.F90 lavent.F90 laventad.F90 laventtl.F90`

`module/yomct0.F90 yomdyn.F90`

`namelist/namct0.nam.h namdyn.nam.h`

`setup/suct0.F90 sudyn.F90 sumpini.F90`

OOPS

Tomas Wilhelmsson, John Hague and Karim Yessad - nat_CY40R1_oops_fc_on_V4 - BR

Geometry and Model refactoring for OOPS

The bulk of these changes is in preparation for a OOPS geometry object, see ifs/oops/geometry_mod.F90, containing the modules YOMDIM, YOMDIMV, YOMMP, YOMGC, YOMGEM, YOMVERT, YOMSTA, YOMSTADLR, YOMLAP and YOMLEG. It also has YOMCSGEOM, YOMGSGEOM and YOMOROG which were split from YOMGC and YOMGEM.

Where not already present, the variables of each module are put in a derived type. For the modules YOMDIM, YOMDIMV, YOMMP and YOMGEM the Fortran 2003 ASSOCIATE construct is used limit the changes to the IFS sources. A similar approach is planned for the OOPS model object, which is expected to contain more than a 100 modules and arrive in CY41.

The Derived Type SPECTRAL_FIELD is used instead of YOMSP (with the current exception of SPVOR_FLT and SPDIF_FLT)

1000 files changed

Filip Vana - pafv_CY40R1_trajectory - BR

Trajectory encapsulation for OOPS

Unification of heterogeneous trajectory code into one structure. At the level of STEPO/TL/AD this structure is sliced for an appropriate model step (determined by actual value of NSTEP) and passed as dummy argument to all computations relevant to an appropriate time slot. There the trajectory could be only accesses through this structure. As a consequence the possibility to access a quantity belonging to different time-slot is no longer supported.

All the quantities being exchanged between the non-linear (NL), TL and AD models are regarded as trajectory. Any other data exchange between those models is generally forbidden. (The only exception from this new

unified approach is the old TL code of the LAM NH dynamics. This unused code was kept unmodified.) All the other data exchanges between NL/TL/AD models (i.e. shallow water SL code, various quantities for TL/AD physics, radar and rain gauges assimilation) were integrated into the unified trajectory structure.

The new trajectory code allows more flexibility in terms of information access. Storing and reading can be done at any place, multiple times (for no extra overhead) and for any desirable fraction of the structure. It also allows to control separately precision for every stored quantity regardless the other fields in the same group. This was achieved by adopting feature like array of arrays used in C but not very much used in Fortran. Despite slight memory reduction (allocated only those quantities being really stored) it seem to bring small performance gain for the trajectory setup code.

The new code maintains bit reproducible results with the original code. There is no impact of computing performance. In terms of memory requirement there is no noticeable difference. The new structure is in addition offering a potential for further reduction of memory requirements provided some sparse structures are only allocated for the time steps they are in use. (The current memory management is quite conservative in this respect, similarly to the reference code).

Files created(IFS):

`module/yomsphyhist.F90`

`var/get_traj_phys.F90 rdphtrajtm_nl.F90 read_surfgrid_traj.F90 store_traj_main.F90 wrphtrajtm_nl.F90`

Files modified(IFS):

`adiab/cpg.F90 cpg2.F90 cpg25.F90 cpg2tl.F90 cpg5.F90 cpg5_gp.F90 cpg_drv.F90 cpg_drv_ad.F90 cpg_drv_tl.F90 cpg_dyn.F90 cpg_dyn_tl.F90 cpg_end.F90 cpgad.F90 cpglag.F90 cpgtl.F90 specrt.F90`

`control/cnt4.F90 cnt4ad.F90 cnt4tl.F90 gp_model.F90 gp_model_ad.F90 gp_model_tl.F90 scan2m.F90 scan2mad.F90 scan2mtl.F90 stepo.F90 stepoad.F90 stepotl.F90`

`dia/wrmlpp.F90 wrmlppg.F90 wrphtrajt.F90 wrsltraj2.F90`

`gbrad/gbrad_setup.F90`

`module/traj_main_mod.F90 traj_physics_mod.F90 traj_semilag_mod.F90 traj_surface_mod.F90 trajectory_mod.F90 yoegwdwms.F90 yoelwrad.F90 yomgbrad.F90 yomncl.F90 yomraingg.F90 yomtraj.F90 yomvwrk.F90`

`namelist/namvwrk.nam.h`

`phys_dmn/aplpar.F90 aplparstl.F90 mf_phys.F90 mf_physad.F90 mf_phystl.F90`

`phys_ec/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 store_traj_phys_layer.F90`

`raingg/raingg_setup.F90`

`setup/susc2b.F90`

`sinvect/lcnorad.F90 lcnortl.F90`

`utility/addfgs.F90 dealsc2.F90 iopack.F90 rdphtrajt.F90 rdsltraj2.F90 sbsfgs.F90`

`var/bgevecs.F90 bgvecs.F90 cosjc.F90 deallt.F90 rdphtrajm.F90 rdphtrajtm.F90 suallt.F90 suecges.F90 suvwrk.F90 vec2gp.F90 wrphtrajm.F90 wrphtrajtm.F90 xformev.F90`

Files modified(SCRIPTS):

`gen/ifsmin`

Files deleted(IFS):

`module/yomtphy.F90`

`var/rdphtrsf.F90 wrphtrsf.F90`

SATELLITE

Alan Geer - stg_SB40R1_sat_section_for_40r1_5 - not-BR

This is the merged Satellite section branch which contains the following eight branches:

Expts: control=g1nf , test=g2ki

Cristina Lupu and Alan Geer - stc_SB40R1_for40r2_interp1_ibm - not-BR

Upgrade of RTTOV fast radiative transfer model (from version 10.2 to version 11.1 + NWP-SAF update on 21/11/2013 + NWP-SAF bug fix available up to 30/01/2014).

Expts: RTTOV-10=g0po , RTTOV-11=g0oi T511/137L 20130107-20131108

The radiative transfer model has been upgraded to RTTOV-11 (v11.1 + updates 21/11/2013 + NWP-SAF bug fix 30/01/2014), provided by the NWP-SAF. The main differences between the RTTOV v11.1 and the RTTOV-10 are summarised in the RD internal memo RD13-090. RTTOV v11.1 reproduces RTTOV v10.2 radiances for identically configured simulations.

The 4D-Var results are not bit identical. There is no scientific impact in RTTOV-11 upgrade and the impact in forecast scores is neutral. Computational performance (billing units, mean over cycles) for the RTTOV-11 experiment appear to be comparable or reduced with the RTTOV-10 experiment.

The existing coefficient files are fully compatible with RTTOV v11. Regeneration of binaries coefficient files for IASI and AIRS is required due to a format change.

Files created(SATRAD):

```
module/mod_rttov_baran_icldata.F90 rttov_bpr_mod.F90 rttov_math_mod.F90
rttov_scattering_mod.F90
programs/create_aer_clim_prof.F90 example_aer_file_fwd.F90
example_aer_param_fwd.F90 rttov_aer_clim_prof.F90 rttov_bpr_calc.F90
rttov_bpr_dealloc.F90 rttov_bpr_init.F90 rttov_calc_weighting_fn.F90
rttov_mie_params_aer.F90 rttov_mie_params_cld.F90 rttov_us76_prof.F90
test_weighting_fn_dev.F90 us76_to_hdf5.F90
rttov/coef_io/rttov_init_coef_optpar_ir.F90 main/rttov_alloc_opt_param.F90 main/rttov_-
baran_calc_icloptpar.F90 main/rttov_baran_calc_icloptpar_ad.F90 main/rttov_baran_-
calc_icloptpar_tl.F90 main/rttov_baran_calc_phase.F90 main/rttov_baran_calc_phase_-
ad.F90 main/rttov_baran_calc_phase_tl.F90 main/rttov_calc_solar_spec_esd.F90 main/rttov_-
calcsatrefl.F90 main/rttov_calcsatrefl_ad.F90 main/rttov_calcsatrefl_tl.F90 main/rttov_-
calcsurfrefl.F90 main/rttov_calcsurfrefl_ad.F90 main/rttov_calcsurfrefl_k.F90 main/rttov_-
calcsurfrefl_tl.F90 main/rttov_init_opt_param.F90 main/rttov_nlte_bias_correction.F90
main/rttov_nlte_bias_correction_ad.F90 main/rttov_nlte_bias_correction_k.F90 main/rttov_-
nlte_bias_correction_tl.F90 main/rttov_user_options_checkinput.F90 mw_scatt_coef/density_-
all.F90 mw_scatt_coef/get_dia.F90 mw_scatt_coef/ice_density.F90 mw_scatt_coef/liu_-
dda.F90 mw_scatt_coef/liu_density.F90 mw_scatt_coef/mie_one_temp.F90 mw_scatt_coef/predict_-
psd_F07.F90 mw_scatt_coef/scattering.F90 other/rttov_coef_info.F90 other/rttov_print_-
info.F90 other/rttov_print_opts.F90
```

Files modified(SATRAD):

include/throw.h
module/mod_cparam.F90 mod_mie.F90 mod_rttov_fastem5_coef.F90
onedvar_variables.F90 rttov_chain.F90 rttov_coef_io_mod.F90 rttov_const.F90
rttov_distribute_mod.F90 rttov_getoptions.F90 rttov_global.F90
rttov_test_k_mod.F90 rttov_types.F90 rttov_unix_env.F90 rttov_zutility.F90
mwave/mwave_emis_rttov.F90 mwave_get_rtcoeff.F90 mwave_obsop_rttov.F90
mwave_obsop_rttov_ad.F90 mwave_obsop_rttov_tl.F90
onedvar/onedvar_get_rtcoeff.F90 onedvar_obsop_grad_rttov.F90
onedvar_obsop_rttov.F90 onedvar_obsop_tl_rttov.F90
programs/example_fwd.F90 example_pc_fwd.F90 example_rttovscatt.F90
rttov_ascii2bin_scattcoef.F90 rttov_conv_coef.F90 rttov_scatt_make_coef.F90
rttov_test.F90 rttov_test_get_pc_predictindex.F90 rttovscatt_test.F90
rttov/coef_io/rttov_coeffname.F90 coef_io/rttov_dealloc_coef.F90 coef_io/rttov_dealloc_-
coef_pccomp.F90 coef_io/rttov_dealloc_coef_scatt_ir.F90 coef_io/rttov_dealloc_coefs.F90
coef_io/rttov_dealloc_optpar_ir.F90 coef_io/rttov_distribute_coef.F90 coef_io/rttov_-
distribute_coef_pccomp.F90 coef_io/rttov_distribute_coef_scatt_ir.F90 coef_io/rttov_-
distribute_optpar_ir.F90 coef_io/rttov_get_pc_predictindex.F90 coef_io/rttov_init_-
coef.F90 coef_io/rttov_init_coef_pccomp.F90 coef_io/rttov_init_coefs.F90 coef_io/rttov_-
nullify_coef.F90 coef_io/rttov_nullify_coef_pccomp.F90 coef_io/rttov_nullify_coef_-
scatt_ir.F90 coef_io/rttov_nullify_optpar_ir.F90 coef_io/rttov_opencoeff.F90 coef_-
io/rttov_read_ascii_coef.F90 coef_io/rttov_read_ascii_pccoef.F90 coef_io/rttov_read_-
ascii_scaercoef.F90 coef_io/rttov_read_ascii_sccldcoef.F90 coef_io/rttov_read_binary_-
coef.F90 coef_io/rttov_read_binary_pccoef.F90 coef_io/rttov_read_binary_scaercoef.F90
coef_io/rttov_read_binary_sccldcoef.F90 coef_io/rttov_read_coefs.F90 coef_io/rttov_-
write_ascii_coef.F90 coef_io/rttov_write_ascii_pccoef.F90 coef_io/rttov_write_ascii_-
scaercoef.F90 coef_io/rttov_write_ascii_sccldcoef.F90 coef_io/rttov_write_binary_-
coef.F90 coef_io/rttov_write_binary_pccoef.F90 coef_io/rttov_write_binary_scaercoef.F90
coef_io/rttov_write_binary_sccldcoef.F90 coef_io/rttov_write_coefs.F90 ifs/rttov_-
ec.F90 ifs/rttov_ec_ad.F90 ifs/rttov_ec_alloc_ad.F90 ifs/rttov_ec_setopts.F90 ifs/rttov_-
ec_tl.F90 ifs/rttvi.F90 main/rttov_ad.F90 main/rttov_add_opdp_path.F90 main/rttov_-
add_prof.F90 main/rttov_add_raytracing.F90 main/rttov_alloc_aux_prof.F90 main/rttov_-
alloc_auxrad.F90 main/rttov_alloc_auxrad_stream.F90 main/rttov_alloc_ircld.F90 main/rttov_-
alloc_opdp_path.F90 main/rttov_alloc_pc_dimensions.F90 main/rttov_alloc_pccomp.F90
main/rttov_alloc_predictor.F90 main/rttov_alloc_prof.F90 main/rttov_alloc_rad.F90
main/rttov_alloc_raytracing.F90 main/rttov_alloc_sunglint.F90 main/rttov_alloc_traj.F90
main/rttov_alloc_traj_dyn.F90 main/rttov_alloc_traj_sta.F90 main/rttov_alloc_trans_-
scatt_ir.F90 main/rttov_alloc_transmission.F90 main/rttov_alloc_transmission_aux.F90
main/rttov_calcbt.F90 main/rttov_calcbt_ad.F90 main/rttov_calcbt_pc.F90 main/rttov_-
calcbt_pc_ad.F90 main/rttov_calcbt_pc_tl.F90 main/rttov_calcbt_tl.F90 main/rttov_-
calcemis_ir.F90 main/rttov_calcemis_ir_ad.F90 main/rttov_calcemis_ir_k.F90 main/rttov_-
calcemis_ir_tl.F90 main/rttov_calcemis_mw.F90 main/rttov_calcemis_mw_ad.F90 main/rttov_-
calcemis_mw_k.F90 main/rttov_calcemis_mw_tl.F90 main/rttov_calcrad.F90 main/rttov_-
calcrad_ad.F90 main/rttov_calcrad_k.F90 main/rttov_calcrad_tl.F90 main/rttov_check_-
traj.F90 main/rttov_checkinput.F90 main/rttov_checkinput_ad.F90 main/rttov_checkinput_-
k.F90 main/rttov_checkinput_tl.F90 main/rttov_checkpcchan.F90 main/rttov_cldstr.F90
main/rttov_cldstr_ad.F90 main/rttov_cldstr_k.F90 main/rttov_cldstr_tl.F90 main/rttov_-
copy_opdp_path.F90 main/rttov_copy_pccomp.F90 main/rttov_copy_prof.F90 main/rttov_-
copy_rad.F90 main/rttov_copy_raytracing.F90 main/rttov_direct.F90 main/rttov_errorhandling.F9
main/rttov_errorreport.F90 main/rttov_fastem5.F90 main/rttov_fastem5_ad.F90 main/rttov_-

fastem5_k.F90 main/rttov_fastem5_tl.F90 main/rttov_fresnel.F90 main/rttov_fresnel_-
ad.F90 main/rttov_fresnel_k.F90 main/rttov_fresnel_tl.F90 main/rttov_init_auxrad_-
stream.F90 main/rttov_init_opdp_path.F90 main/rttov_init_pccomp.F90 main/rttov_init_-
predictor.F90 main/rttov_init_prof.F90 main/rttov_init_rad.F90 main/rttov_init_raytracing.F90
main/rttov_init_trans_scatt_ir.F90 main/rttov_init_transmission.F90 main/rttov_init_-
transmission_aux.F90 main/rttov_intavg_chan.F90 main/rttov_intavg_chan_ad.F90 main/rttov_-
intavg_chan_k.F90 main/rttov_intavg_chan_tl.F90 main/rttov_intavg_prof.F90 main/rttov_-
intavg_prof_ad.F90 main/rttov_intavg_prof_k.F90 main/rttov_intavg_prof_tl.F90 main/rttov_-
integrate.F90 main/rttov_integrate_ad.F90 main/rttov_integrate_k.F90 main/rttov_-
integrate_tl.F90 main/rttov_k.F90 main/rttov_layeravg.F90 main/rttov_layeravg_ad.F90
main/rttov_layeravg_k.F90 main/rttov_layeravg_tl.F90 main/rttov_locpat.F90 main/rttov_-
locpat_ad.F90 main/rttov_locpat_k.F90 main/rttov_locpat_tl.F90 main/rttov_mult_profiles_-
k.F90 main/rttov_opdep.F90 main/rttov_opdep_9.F90 main/rttov_opdep_9_ad.F90 main/rttov_-
opdep_9_k.F90 main/rttov_opdep_9_solar.F90 main/rttov_opdep_9_solar_ad.F90 main/rttov_-
opdep_9_solar_k.F90 main/rttov_opdep_9_solar_tl.F90 main/rttov_opdep_9_tl.F90 main/rttov_-
opdep_ad.F90 main/rttov_opdep_k.F90 main/rttov_opdep_tl.F90 main/rttov_opdpscattir.F90
main/rttov_opdpscattir_ad.F90 main/rttov_opdpscattir_k.F90 main/rttov_opdpscattir_-
tl.F90 main/rttov_opts_eq.F90 main/rttov_pcscores.F90 main/rttov_pcscores_ad.F90 main/rttov_-
pcscores_k.F90 main/rttov_pcscores_rec_k.F90 main/rttov_pcscores_tl.F90 main/rttov_-
profaux.F90 main/rttov_profaux_ad.F90 main/rttov_profaux_k.F90 main/rttov_profaux_-
tl.F90 main/rttov_reconstruct.F90 main/rttov_reconstruct_ad.F90 main/rttov_reconstruct_-
k.F90 main/rttov_reconstruct_tl.F90 main/rttov_refsun.F90 main/rttov_refsun_ad.F90
main/rttov_refsun_k.F90 main/rttov_refsun_tl.F90 main/rttov_setgeometry.F90 main/rttov_-
setgeometry_ad.F90 main/rttov_setgeometry_k.F90 main/rttov_setgeometry_tl.F90 main/rttov_-
setpredictors_7.F90 main/rttov_setpredictors_7_ad.F90 main/rttov_setpredictors_7_-
k.F90 main/rttov_setpredictors_7_tl.F90 main/rttov_setpredictors_8.F90 main/rttov_-
setpredictors_8_ad.F90 main/rttov_setpredictors_8_k.F90 main/rttov_setpredictors_-
8_tl.F90 main/rttov_setpredictors_9.F90 main/rttov_setpredictors_9_ad.F90 main/rttov_-
setpredictors_9_k.F90 main/rttov_setpredictors_9_solar.F90 main/rttov_setpredictors_-
9_solar_ad.F90 main/rttov_setpredictors_9_solar_k.F90 main/rttov_setpredictors_9_-
solar_tl.F90 main/rttov_setpredictors_9_tl.F90 main/rttov_tl.F90 main/rttov_transmit.F90
main/rttov_transmit_9_solar.F90 main/rttov_transmit_9_solar_ad.F90 main/rttov_transmit_-
9_solar_k.F90 main/rttov_transmit_9_solar_tl.F90 main/rttov_transmit_ad.F90 main/rttov_-
transmit_k.F90 main/rttov_transmit_tl.F90 main/rttov_user_profile_checkinput.F90 mw_-
scatt/rttov_dealloc_scattcoeffs.F90 mw_scatt/rttov_emis_retrieval.F90 mw_scatt/rttov_-
hydro.F90 mw_scatt/rttov_hydro_ad.F90 mw_scatt/rttov_hydro_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_mieproc.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_setupindex.F90 mw_scatt/rttov_-
scatt_tl.F90 mw_scatt/rttov_setpressure.F90 mw_scatt/rttovscatt_test_one.F90 mw_-
scatt_coef/convert_mietable.F90 mw_scatt_coef/gamma_dsd.F90 mw_scatt_coef/melting_-
layer.F90 mw_scatt_coef/mg_ellips.F90 mw_scatt_coef/mie_coated_sphere.F90 mw_scatt_-
coef/mie_one_wc.F90 mw_scatt_coef/mie_sphere.F90 mw_scatt_coef/n0_t.F90 mw_scatt_-
coef/perm_melt.F90 mw_scatt_coef/permittivity.F90 mw_scatt_coef/predict_psd.F90 mw_-
scatt_coef/set_spectra.F90 other/rttov_print_profile.F90 parallel/rttov_parallel_-
ad.F90 parallel/rttov_parallel_direct.F90 parallel/rttov_parallel_k.F90 parallel/rttov_-
parallel_tl.F90 test/rttov_k_ad.F90 test/rttov_k_bf.F90 test/rttov_k_tl.F90 test/rttov_-

make_pccomp_inc.F90 test/rttov_make_profile_inc.F90 test/rttov_make_radiance_inc.F90 test/rttov_scale_pccomp_inc.F90 test/rttov_scale_profile_inc.F90 test/rttov_scale_radiance_inc.F90

Files modified(SCRIPTS):

gen/mklinks

Files deleted(SATRAD):

module/mod_rttov_fastem4_coef.F90

programs/aer_clim_prof.F90 create_tables_spectra.F90

rttov/coef_io/rttov_setup.F90 main/rttov_copy_transmission.F90 main/rttov_fastem4.F90 main/rttov_fastem4_ad.F90 main/rttov_fastem4_k.F90 main/rttov_fastem4_tl.F90 mw_scatt_coef/density_totalice.F90 mw_scatt_coef/predict_psd_f07.F90

Alan Geer, Fabrizio Baordo and Masahiro Kazumori - stg_CY40R1_stg_CY40R1_mhs_allsky_2 - not-BR, PASSIVE

All-sky microwave developments

- Preparations for assimilating MHS through the all-sky route
- Land and sea-ice capability for all-sky microwave, including passive monitoring of these surfaces for SSMIS-F17
- New relative wind direction model for microwave surface emissivities, currently switched off

Files created(IFS):

mwave/mwave_assign_emis_mhs.F90 mwave_assign_emis_ssmis.F90

Files created(ODB):

ddl.ECMA/sufger_allsky_body.sql

ddl/sufger_allsky_body.sql

Files created(SATRAD):

interface/distance_between.h

module/mod_cnrm_mw_atlas.F90 mod_mwatlas.F90 mod_rttov_emis_atlas.F90

programs/get_satinfo.F90

rttov/emis_atlas/rttov_atlas_setup.F90 emis_atlas/rttov_deallocate_atlas.F90 emis_atlas/rttov_get_emis.F90

Files created(SCRIPTS):

sms_an/archive_mhs_allsky.sms b2o_mhs_allsky.sms convert_mhs_allsky.sms

Files modified(IFS):

module/varbc_allsky.F90 yommwave.F90

mwave/mwave_cpfrac.F90 mwave_emis.F90 mwave_get.F90 mwave_obsop.F90 mwave_obsop_ad.F90 mwave_obsop_tl.F90 mwave_obsop_traj.F90 mwave_put.F90 mwave_read_sat_error.F90 mwave_screen.F90 mwave_setup.F90

namelist/nammwave.nam.h

obs_preproc/gefger.F90

Files modified(ODB):

`bufr2odb/bufr2odb_atovs.F90 bufr2odb_ssmi.F90 bufr2odb_ssmis_1d.F90 bufr2odb_tmi_1d.F90 bufr2odb_windsat.F90`

`cma2odb/ctxinitdb.F90 getdb.F90 map_reportype.F90`

`ddl/satbody_allsky.sql`

Files modified(SATRAD):

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

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

`pre_screen/distance_between.F90`

`programs/bufr_grid_screen.F90 bufr_screen_amsr2_1d.F90 bufr_screen_ssmi_1d.F90 bufr_screen_ssmis_1d.F90 bufr_screen_tmi_1d.F90`

`rttov/ifs/rttvi.F90 main/rttov_ad.F90 main/rttov_calcemis_mw.F90 main/rttov_calcemis_mw_ad.F90 main/rttov_calcemis_mw_k.F90 main/rttov_calcemis_mw_tl.F90 main/rttov_direct.F90 main/rttov_fastem5.F90 main/rttov_fastem5_ad.F90 main/rttov_fastem5_k.F90 main/rttov_fastem5_tl.F90 main/rttov_k.F90 main/rttov_tl.F90 mw_scatt/rttov_iniscatt.F90 mw_scatt/rttov_iniscatt_ad.F90 mw_scatt/rttov_iniscatt_tl.F90 mw_scatt/rttov_scatt.F90 mw_scatt/rttov_scatt_ad.F90 mw_scatt/rttov_scatt_tl.F90`

Files modified(SCRIPTS):

`def/an.def`

`gen/bufr2odb convert_obsgroup ifsmin ifstraj mklinks pre1crad_screen premwimg sstana varconsts`

Alan Geer - stg_CY39R1_cloudy_ir_2 - BR

All-sky IR developments

- Extensive bugfixes in the TL/AD cloudy IR observation operator
- New 2-stream cloud column model in RTTOV
- Code cleaning in rttov_ec routines
- New PrepIFS option LRTTOV_ADTEST, which switches on an independent adjoint test for each RTTOV observation packet. This enables easy identification of which observation type and observation set is causing adjoint failures.

On top of RTTOV-11, so not all these files were modified:

Files created(IFSAUX):

`module/rttov_ec_mod.F90`

Files created(SATRAD): `mod_rttov_baran_icldata.F90 rttov_bpr_mod.F90 rttov_ec_settings.F90 rttov_scattering_mod.F90`

`programs/example_aer_fwd.F90 rttov_bpr_calc.F90 rttov_bpr_dealloc.F90 rttov_bpr_init.F90 rttov_calc_weighting_fn.F90 rttov_mie_params.F90 rttov_us76_prof.F90 test_weighting_fn_dev.F90 us76_to_hdf5.F90`

rttov/coef_io/rttov_init_coef_optpar_ir.F90 main/rttov_alloc_opt_param.F90 main/rttov_-
baran_calc_icloptpar.F90 main/rttov_baran_calc_icloptpar_ad.F90 main/rttov_baran_-
calc_icloptpar_tl.F90 main/rttov_baran_calc_phase.F90 main/rttov_baran_calc_phase_-
ad.F90 main/rttov_baran_calc_phase_tl.F90 main/rttov_calc_solar_spec_esd.F90 main/rttov_-
calcsatrefl.F90 main/rttov_calcsatrefl_ad.F90 main/rttov_calcsatrefl_tl.F90 main/rttov_-
calcsurfrefl.F90 main/rttov_calcsurfrefl_ad.F90 main/rttov_calcsurfrefl_k.F90 main/rttov_-
calcsurfrefl_tl.F90 main/rttov_init_opt_param.F90 main/rttov_nlte_bias_correction.F90
main/rttov_nlte_bias_correction_ad.F90 main/rttov_nlte_bias_correction_k.F90 main/rttov_-
nlte_bias_correction_tl.F90 main/rttov_user_options_checkinput.F90 mw_scatt_coef/get_-
dia.F90 mw_scatt_coef/ice_density.F90 mw_scatt_coef/liu_dda.F90 mw_scatt_coef/liu_-
density.F90 mw_scatt_coef/mie_one_temp.F90 mw_scatt_coef/predict_psd_F07.F90 mw_-
scatt_coef/scattering.F90 other/rttov_print_info.F90 other/rttov_print_opts.F90

Files modified(IFS):

module/sats_mix.F90 testvar_mix.F90

namelist/namsats.nam.h

obs_preproc/defrun.F90 sugoms.F90

op_obs/bgobs.F90 co2slicing.F90 hretr.F90 radtr.F90 radtr_ml.F90 radtr_ml_ad.F90
radtr_ml_tl.F90 radtrad.F90 radtrtl.F90

phys_dmn/mts_phys.F90

var/surad.F90

Files modified(SATRAD):

include/throw.h

interface/rttov_ec.h rttov_ec_ad.h rttov_ec_alloc.h rttov_ec_alloc_ad.h
rttov_ec_alloc_tl.h rttov_ec_tl.h

module/mod_cparam.F90 mod_mie.F90 mod_rttov_fastem5_coef.F90
onedvar_variables.F90 rttov_chain.F90 rttov_coef_io_mod.F90 rttov_const.F90
rttov_distribute_mod.F90 rttov_getoptions.F90 rttov_global.F90
rttov_test_k_mod.F90 rttov_types.F90 rttov_unix_env.F90

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

onedvar/onedvar_get_rtcoeff.F90 onedvar_obsop_grad_rttov.F90
onedvar_obsop_rttov.F90 onedvar_obsop_tl_rttov.F90

programs/aer_clim_prof.F90 calc_radiance_fields.F90 create_tables_spectra.F90
example_fwd.F90 example_pc_fwd.F90 example_rttovscatt.F90 gensatim.F90
rttov_ascii2bin_scattcoef.F90 rttov_conv_coef.F90 rttov_scatt_make_coef.F90
rttov_test.F90 rttov_test_get_pc_predictindex.F90 rttovscatt_test.F90 etc. etc.

Files modified(SCRIPTS):

gen/ifsmin ifstraj mklinks

Files deleted(SATRAD):

module/mod_rttov_fastem4_coef.F90

rttov/coef_io/rttov_setup.F90 main/rttov_fastem4.F90 main/rttov_fastem4_ad.F90 main/rttov_-
fastem4_k.F90 main/rttov_fastem4_tl.F90 mw_scatt_coef/predict_psd_f07.F90

Alan Geer - stg_CY39R1_blacklist_tidy - BR

Blacklist tidying and safety

In response to random failures in the blacklist code, the black.F90 code was tidied and the associated ODB SQLs were made consistent. There should now be a smaller likelihood of typical blacklist and ODB interface problems, e.g. blacklist variables being silently unavailable for certain observation types; segmentation violations etc.

Files modified(IFS):

`obs_preproc/black.F90 blackhat.F90`

Files modified(ODB):

`ddl/black_robhdr_1.sql black_robhdr_10.sql black_robhdr_2.sql black_robhdr_3.sql black_robhdr_4.sql black_robhdr_7.sql black_robhdr_8.sql black_robhdr_9.sql black_robody_1.sql black_robody_10.sql black_robody_2.sql black_robody_3.sql black_robody_4.sql black_robody_7.sql black_robody_8.sql black_robody_9.sql`

Files deleted(ODB):

`ddl.ECMA/black_robhdr_6.sql black_robody_6.sql`

`ddl/black_robhdr_6.sql black_robody_6.sql`

Sean Healy - sti_SB40R1_for_sat_package - BR

Assimilation of GPS-RO

Introduce changes required for assimilating the GPS-RO data with a 2D operator in 40R3. The 2D operator is switched off in 40R2 because NOBSPROFS=1 in the ifstraj and ifsmin scripts. The BUFR2ODB step has been modified to batch the the GPS-RO data into groups of 11 points in the vertical.

Files modified(IFS):

`module/yomlimb.F90 obs_preproc/limb_plane.F90 op_obs/gpscalc_alpharkm2.F90 gpscalc_alpharkm2ad.F90 gpscalc_alpharkm2tl.F90 gpscalc_compress2d.F90 gpscalc_compress2dad.F90 gpscalc_compress2dtl.F90 gpscalc_nr2d.F90 gpscalc_nr2dad.F90 gpscalc_nr2dtl.F90 gpscalc_refrac2d.F90 gpscalc_refrac2dad.F90 gpscalc_refrac2dtl.F90 gpsro_2dad.F90 gpsro_2dop.F90 gpsro_2dtl.F90`

Files modified(ODB):

`bufr2odb/bufr2odb_radio_lat_long.F90`

Files modified(SCRIPTS):

`gen/ifsmin ifstraj`

Niels Bormann, Andrew Collard - str_SB40R1_for_40R2 - BR

Option to account for inter-channel error correlations for radiances

The branch allows the use of inter-channel error correlations for radiances in the assimilation, as well as for the observation perturbations used in the EDA. By default, the option is currently not used.

The inter-channel error correlations can be specified through a text file which in the case of AIRS, IASI and CrIS is the same as the error file currently read. The correlation information is specified after a key-word "CORRELATIONS" appended to the error file, followed by the number of channels for which correlation information is provided, followed by the channel numbers, and finally the error correlation matrix itself. If

the key-word "CORRELATIONS" is not present, no error correlations will be used and a diagonal observation error covariance matrix will be assumed.

The inter-channel error correlations are included in HJO through a call to the new routine INTERCHAN_-OBSERR_COR which uses a Cholesky decomposition to divide $(y-H(x))/\sigma_O$ by the error correlation matrix.

Files created(IFS):

`obs_preproc/pertobs_interchan_corr.F90`

`op_obs/cholesky.F90 interchan_obserr_cor.F90`

Files modified(IFS):

`module/yomcosjo.F90`

`obs_preproc/defrun.F90 pertobs.F90 pertobs_uncorr.F90`

`op_obs/hjo.F90`

Files modified(ODB):

`ddl/pertobs_uncorr_robody.sql`

Files modified(SCRIPTS):

`gen/varconsts`

Heather Lawrence, Niels Bormann - sthl_SB40R1_for_CY40R2 - not-BR

Bug fix for the skin temperature sink variable for clear-sky radiances of IR and MW sounders

Expts: control=g1nf , test=g1ub

This branch fixes a bug in the skin temperature sink variable used in the clear-sky assimilation of MW and IR sounder radiances, affecting the AMSU-A, MHS, IASI, AIRS and HIRS instruments. The bug led to the background value for the sink variable to be incorrectly specified for the second and third outer loops. Also the starting value for the third outer loop was incorrectly set to be the output of the first outer loop instead of the output of the second outer loop.

The branch corrects these problems and in order to do this a new variable is introduced: skintemp_4. In the new branch, skintemp_1 is the background skin temperature (equal to tsfc, the model skin temperature), skintemp_2 is the output of the first outer loop, skintemp_3 is the output of the second outer loop and skintemp_4 is the output of the third outer loop. Additionally the error assigned to the skin temperature sink variable over sea-ice was increased from 5K to 7.5K. This was done because fixing the bug had the effect of constraining the sink variable to be closer to the model value (tsfc) over seaice which led to a degradation in forecast scores over seaice. Increasing the error to 7.5K mitigated this.

Files modified(IFS):

`common/yomdb_vars.h`

`obs_preproc/setup_tovscv.F90`

`oops/allobs_mod.F90`

`op_obs/hradp.F90 hradp_ml.F90 hradp_ml_tl.F90 hradptl.F90`

`var/surad.F90`

Files modified(ODB):

`cma2odb/initmdb.F90`

`ddl/cycle_biasprep_satpred.sql ecmwf_matchupsink.sql ensemble.h matchupsink.sql radiance.h`

robhdr_rad.sql sat_atovs.sql sathdr_screen_atovs.sql setup_tovscv.sql

Files modified(SCRIPTS):

gen/add_enda_to_sql.pl

Niels Bormann and Heather Lawrence - str_SB40R1_for_CY40R3 - not-BR

Preparations for ATMS over land; channel-specific scaling for the radiance SES fields

The branch prepares for the assimilation of ATMS over land, even though surface-sensitive ATMS channels remain blacklisted in 40r2. The preparations include updates to the quality control over land for ATMS in mw_clearsky_screen and minor adjustments to the the land/seaice/sea discrimination for the general dynamic emissivity estimation. The branch also includes changes to the emissivity Kalman Filter atlas in the satrad project to generate a separate atlas for ATMS. These changes are temporary only and to be replaced with a more generic emissivity Kalman Filter in 40r3.

The branch also introduces channel-specific default scaling factors to be used in the derivation of the SES fields from the ES fields for radiances (ie in the derivation of the background error estimates used in the FG-check). Previously, one general default value was used which is sub-optimal for humidity channels or stratospheric temperature channels. As before, the default scaling is only used if no sensible scaling can be derived from observation departures; in 40r3, this will always be the case for MHS observations due to their move to the all-sky system. The change only affects EDA runs.

Files created(ODB):

ddl.ECMA/emiskf_atms.sql

ddl/emiskf_atms.sql

Files created(SATRAD):

programs/emiskf_update_atms.F90

Files modified(IFS):

op_obs/hretr.F90 mw_clearsky_screen.F90

setup/suemis_conf.F90

var/surad.F90

Files modified(SATRAD):

emiss/emiskf_init.F90 emiskf_prep_h.F90

module/eda_rad_aux.F90

programs/eda_rad_scale.F90

Files modified(SCRIPTS):

gen/eda_rad_req.txt emiskf mkabs_satrad

Alan Geer - stg_CY40R1_rttov_scatt_stability - not-BR

RTTOV-SCATT numerical stability bug-fix

A crash in operations in January 2014 was traced to a numerical stability issue in RTTOV-SCATT, which is fixed in this branch. The problem was so rare (once in 8 years) that it was not worth an emergency fix for operations, and it has been left to the next cycle upgrade.

Testing:1 month at T511 vs. operational configuration. No significant changes to scores or obstats.

Files modified(SATRAD):

`rttov/mw_scatt/rttov_integratesource.F90 mw_scatt/rttov_integratesource_ad.F90 mw_-scatt/rttov_integratesource_tl.F90`

ODB

Peter Lean - dipl_SB40R1_mf_country_col - BR

New Meteo-France 'country' column

Expts: control=g1nn , test=g1nm

Files modified(ODB):

`cma2odb/initmdb.F90 ddl/conv.h`

Files modified(IFS):

`common/yomdb_defs.h yomdb_vars.h`

MACC

Richard Engelen - stj_SB40R1_MACC_for_cy40r2 - BR

Updates for MACC

Expts: control=g24t , test=g24v

Contribution to this cycle from the CA section and the PA section related to the MACC configuration consists of various improvements and bug fixes for the C-IFS code both in terms of the model and the data assimilation code. The aerosol model was updated with various technical changes to include oceanic DMS emissions and extend the capability of modelling volcanic aerosol.

Files created(IFS):

`chem/aer2massdia.F90 tm5_ibud.F90 tm5_macc_aerosol.F90 tm5_rbud.F90 tm5_stratbc_ch4.F90 tm5_wetchem.F90`
`control/cpicgfl.F90`
`namelist/namvolcano.h`
`phys_ec/aer2massdia_layer.F90 aer_vso2so4.F90`

Files modified(IFS):

`adiab/postphy.F90`
`chem/chem_inext.F90 chem_init.F90 chem_main.F90 chem_massdia.F90 chem_scav.F90 chem_tm5.F90 cod_op_tm5.F90 tm5_aerosol_info.F90 tm5_boundary_ch4.F90 tm5_calrates.F90 tm5_chem_ini.F90 tm5_directflux.F90 tm5_do_ebi.F90 tm5_photo_flux.F90 tm5_photorates_tropo.F90 tm5_pifm_ran.F90 tm5_slingo.F90`
`climate/updclie.F90`
`control/cdsta.F90 tracmf.F90`

fullpos/hpos.F90 specfitg.F90 wrmlfp.F90

module/chem_mix.F90 parfpos.F90 surface_fields_mix.F90 tm5_chem_module.F90 tm5_photolysis_new.F90 varbc_pred.F90 varbc_to3.F90 yoeaersnk.F90 yoeaersrc.F90 yoeaervol.F90 yoeclop550.F90 yoerad.F90 yom_grib_codes.F90 yom_ygfl.F90 yomafn.F90 yommcc.F90 yomphyder.F90 yomppc.F90

namelist/naeaer.nam.h namafn.nam.h

obs_preproc/first.F90

op_obs/aod_ad.F90 hop.F90 hopad.F90 hoptl.F90 hradp_ml.F90 hradp_ml_ad.F90 hradp_ml_tl.F90 preinttl.F90 radtr_ml.F90 radtr_ml_ad.F90 radtr_ml_tl.F90

phys_ec/aer_bdgtmss.F90 aer_cld.F90 aer_dmso.F90 aer_lidsim.F90 aer_phy1.F90 aer_phy2.F90 aer_phy3.F90 aer_phy3_layer.F90 aer_rad.F90 aer_rrtm.F90 aer_src.F90 aer_tau.F90 aer_volce.F90 aerini_layer.F90 aero_init.F90 callpar.F90 chem_main_layer.F90 climaer_layer.F90 culight.F90 gems_init.F90 lightning_layer.F90 local_arrays_fin.F90 local_arrays_ini.F90 phys_arrays_ini.F90 radintg.F90 radlswr.F90 su_aerp.F90 su_aerw.F90 su_clop550.F90

phys_radi/rrtm_ecrt_140gp_mcica.F90 srtm_srtm_224gp_mcica.F90 suecrad.F90 uvradi.F90

pp_obs/ppobsa.F90 ppobsaad.F90 ppobsatl.F90

setup/su0phy.F90 su_surf_flds.F90 suafn1.F90 suafn2.F90 suafn3.F90 sudefo_gflattr.F90 sugfl1.F90 sumcclag.F90 supp.F90

utility/sualspajb.F90 updtim.F90

var/estsig.F90 jbchvari.F90 jbchvariad.F90 rdfpinc.F90 sujb.F90 sujbwavelet.F90 vec2gp.F90

Files modified(ODB):

cma2odb/map_reportype.F90

Files modified(SCRIPTS):

gen/add_nrt_fire_chem anil anpl chem_setup fetchobs gems_setup get_gems_surface get_nrt_fire_chem ifsmin ifstraj mklinks model prep_flux prep_initcond

sms_an/anpl.sms

Files deleted(IFS):

chem/tm5_cloud_info.F90 tm5_getextra.F90 tm5_incbud.F90 tm5_reacbud.F90

module/tm5_photolysis_mix.F90

Richard Engelen and Alan Geer - stj_SB40R1_MACC_cray_17Mar - not-BR

Varbc stats accumulation streamlined for OpenMP

Expts: control=g20l, test=g2a1

Files modified(IFS):

chem/chem_drydep.F90 tm5_chem_ini.F90

module/varbc_eval.F90 varbc_pred.F90

mwave/mwave_emis.F90 mwave_obsop.F90 mwave_obsop_ad.F90 mwave_obsop_tl.F90

op_obs/hop.F90 hopad.F90 hoptl.F90 hretr.F90 radtr_ml_ad.F90

O-SUITE

Gabor Radnoti - das_CY40R1_osuite - not-BR

Updates for 40r1 operational suite running on IBM

Files created(ODB):

bufr2odb/b2o_f008042.F90 bufr2odb_temp_hi_res.F90

Files created(SCRIPTS):

gen/smrescale_res

Files modified(IFS):

climate/updclie.F90
module/yomcoctp.F90
obs_preproc/suscre1.F90 tempin.F90
op_obs/hretr.F90 mopitt_ak_ad.F90 mopitt_ak_op.F90 mopitt_ak_tl.F90
setup/cmoctmap.F90 cmoctmap_inv.F90
smos/smos_update.F90
var/sujb.F90

Files modified(OBSTAT):

module/statsoft.F90
src/inisoftdef.F90 inisoftflag.F90 inisoftinstr.F90 outcoverage.F90 updsoft.F90 writegribs.F9

Files modified(ODB):

bufr2odb/bufr2odb_pgps.F90
cma2odb/buf2cmat_new.F90 buoctmap.F90 map_reportype.F90 subuoctp.F90
module/bufr_module.F90 yomboctp.F90
tools/Bufr2odb.F90

Files modified(PREPDATA):

programs/Ensemble_Stats.F90 Spectral_Filter.F90 Spread_Skill_Time_Avg.F90 unbal_-
eda.F90

Files modified(SATRAD):

cmem/cmem_soil.F90
interface/dielsoil_sub.h dielwat_sub.h rghref_sub.h veg_sub.h

Files modified(SCRIPTS):

def/an.def
gen/ansfc archive_obs archive_obsgroup bcsst biassave bufr2odb chem_setup
convert_obsgroup cycle_times eda_err_save ens_cal_rad ens_errors ens_errors_rad
ens_stats_gather fetchmars fetchobs gems_setup getgrb getini getinigems getmars
getpersSST ifsmin ifsoops ifstraj libsgen mkidta_eps mklinks model modeleps_nemo
obstat obstat_init preobs prep_couplo4 prep_initcond restart_999 sekf_sm soilana
update_ensemble_metadata var_include varconsts
oce/storm
sens/m1.sms
sms/getini.sms getiniLeg.sms getpersSST.sms intHtoL.sms links.sms nemo_tools.sms

targets.sms wavini.sms

sms_an/eda_err_save.sms ens_errors_rad.sms

wav/wave_getobs wave_getrst wave_newverify

Files modified(SSA):

sub/feedback_odb.F90

Files modified(WAM):

Wam_oper/chief.F implsch.F initmdl.F outbs.F updnemofields.F wvalloc.F wvdealloc.F

module/yowmean.F

TECHNICAL

Gabor Radnoti, Paul Burton, Alan Geer, Peter Towers, Deborah Salmond - das_CY40R1_osuite_cray - not-BR

Updates for running 40r1 operational suite on Cray

Expts:Winter control=g1nf, test on IBM=g1sj, test on Cray=g291

Expts:Summer control=g1nt, test on IBM=g24a, test on Cray=g29p

Libraries (40r1C) with fixes for porting to Cray + osuite were made and tested on IBM and Cray.

Files created(IFS):

utility/ectrbk.F90 ecwrite.F90

Files created(IFSAUX):

support/cgmtime.c

Files created(ODB):

bufr2odb/b2o_f008042.F90 b2o_gbyte.F90 b2o_sbyte.F90 bufr2odb_temp_hi_res.F90

Files created(SCRIPTS):

build/arch/Makefile.in.XC30_cce arch/Makefile.in.cca arch/Makefile.in.ccb arch/Makefile.in.cce arch/Makefile.in.cct arch/Makefile.in.cray_XC30_cce

functions.pifs/ADDFIELDS CHECK_DIR CHECK_DIR_NO_MAKE COUPLED_RUN ERA40_EXP ERROR GET GETSV IS_SFC_AN NEWADIR NEWFDIR NEWFSBDIR NEWWDIR PSFILE PUT SMSRCP SMSSTOP ecflow/SMSRCP ecflow/smsabort ecflow/smscomplete ecflow/smsevent ecflow/smsinit ecflow/smslabel ecflow/smsmeter ecflow/smswait ecflow/xabort ecflow/xcomplete ecflow/xevent ecflow/xinit ecflow/xlabel ecflow/xmeter ecflow/xmsg ecflow/xwait fcat isksh93 module sms/xabort sms/xcomplete sms/xevent sms/xinit sms/xlabel sms/xmeter sms/xmsg

gen/smrescale_res

sms/fc_sens_save_amsr2.sms

Files modified(ALGOR):

external/linalg/syminv.F

module/jb_control_vectors_para_mod.F90

Files modified(COPE):

cope/filters/InstrumentHeightAssigner.h

Files modified(ENKF):

module/analysis_mod.F03 inflation_mod.F03 post_inflate_mod.F03

Files modified(IFS):

chem/tm5_directflux.F90

control/cnt3.F90

io_serv/io_serv_open.F90

module/gom_mod.F90 iostream_mix.F90 varbc_setup.F90 yomcoctp.F90

mwave/mwave_wrapper.F90

obs_preproc/ngenada.F90 suscre1.F90 tempin.F90

oops/fields_mod.F90

op_obs/cloud_estimate.F90 hop.F90 hretr.F90 mopitt_ak_ad.F90 mopitt_ak_op.F90 mopitt_ak_tl.F90

parallel/fptrdtoa.F90

phys_ec/ec_phys_drv.F90 spbsgpupd.F90

setup/cmoctmap.F90 cmoctmap_inv.F90 sumpini.F90 sumpout.F90 surand1.F90 susc2b.F90

smos/smos_update.F90

utility/opdis.F90

var/balnonlintl.F90 sujb.F90 sujbwavgen.F90 supert.F90

Files modified(IFSAUX):

module/mpl_broadcast_mod.F90 mpl_send_mod.F90 stack_mix.F90

support/drhook.c ifssig.c stack_overwrite.F90 timef.F

utilities/gentrbk.F90

Files modified(OBSTAT):

src/inisoftdef.F90 inisoftflag.F90 inisoftinstr.F90 outcoverage.F90 updsoft.F90

Files modified(ODB):

bufr2odb/b2o_f008001.F90 bufr2odb_205.F90 bufr2odb_aircraft.F90
bufr2odb_airs.F90 bufr2odb_amsr2_1d.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_ims.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_gauges.F90 bufr2odb_rain_rates.F90
bufr2odb_reo3.F90 bufr2odb_satob.F90 bufr2odb_scat.F90 bufr2odb_smos.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 o2b_f008001.F90

cma2odb/buf2cmat_new.F90 buoctmap.F90 create_averaged_values.F90
grid_nearest.F90 map_reportype.F90 store_enda.F90 subuoctp.F90

include/odb.h

lib/msgpass_loaddata.F90 msgpass_storedata.F90 set_err_trap.F90

module/bufr_module.F90 yomboctp.F90

tools/Bufr2odb.F90 Odb2_to_odb1_era.F90 Split_bufr_data.F90 Split_bufr_per_subtype.F90

Files modified(OOPS):

ifs/model/ObsVector.interface.F90

Files modified(PREPDATA):

mc_tools/add_pert.F90 svgp2sp.F90 svsp2gp.F90

module/svgg.F90 svtools.F90

programs/Ensemble_Stats.F90 Spectral_Filter.F90 Spread_Skill_Time_Avg.F90
gptosp.F90 soilinc.F90 sptogp.F90 sqrt.F90 unbal_eda.F90 uvtovod.F90 vod2uv.F90

tcyc/traj.F90

Files modified(SATRAD):

cmem/cmem_soil.F90

interface/dielsoil_sub.h dielwat_sub.h rghref_sub.h veg_sub.h

module/bufr_grid_screen_keep.F90 rttov_ec_traj.F90

programs/bufr_resat_thin.F90 bufr_screen_amsr2_1d.F90 bufr_screen_cris.F90
bufr_screen_iasi.F90 bufr_screen_mwri_1d.F90 bufr_screen_nexrad.F90
bufr_screen_smos.F90 bufr_screen_ssmi_1d.F90 bufr_screen_ssmis_1d.F90
bufr_screen_synop_rain_gauges.F90 bufr_screen_tmi_1d.F90
bufr_screen_windsat_1d.F90 eda_rad_coefs.F90 eda_rad_scale.F90
geos_prescreen.F90 reo3_prescreen.F90 screen_1c.F90

rttov/ifs/rttov_ec.F90 ifs/rttov_ec_ad.F90 ifs/rttov_ec_alloc.F90 ifs/rttov_ec_alloc_-
ad.F90 ifs/rttov_ec_alloc_tl.F90 ifs/rttov_ec_tl.F90 ifs/rttvi.F90 mw_scatt/rttov_-
boundaryconditions.F90 mw_scatt/rttov_boundaryconditions_ad.F90 mw_scatt/rttov_boundarycondit
tl.F90 mw_scatt/rttov_eddington.F90 mw_scatt/rttov_eddington_ad.F90 mw_scatt/rttov_-
eddington_tl.F90

Files modified(SCAT):

module/bufr_dims.F

Files modified(SCRIPTS):

build/Makefile Makefile.root.bl Makefile.root.oasis3 Makefile.root.oops

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

era/varbc_merge_sort.py

gen/ansfc archive_an.ksh archive_fc.ksh archive_flx.ksh archive_obs
archive_obsgroup bcsst biassave blcomp bufr2odb chem_setup convert_obsgroup
create_forcing.ksh create_init_clim.ksh create_schema cycle_times eda_err_save
emiskf ens_cal ens_cal_rad ens_errors ens_errors_rad ens_fetch_fields
ens_stats_gather ens_stats_mem fast_sgint fc_sens_save fetch_jb_fields_mem
fetchmars fetchobs gems_setup getgrb getini getinigems getmars getpersSST ifsmin
ifsoops ifstraj libsgen lowres_fp mkabs_aeolus mkabs_an mkabs_b2otools
mkabs_black mkabs_cope mkabs_enkf mkabs_fc mkabs_kpptools mkabs_matools
mkabs_mctools mkabs_mofctools mkabs_obsproc mkabs_obstat mkabs_odbtools
mkabs_prepdata mkabs_reanal mkabs_satim mkabs_satrad mkabs_scat mkabs_ssa
mkabs_tcyctools mkabs_wam mkgenlinks mkidta mkidta_eps mkidta_ocean mkidta_sens
mklinks mmeans_pg mmeans_pl model modeleps modeleps_nemo modelsv obstat
obstat_init odb2odb1 odbcomp p4_mklib preCleanFDB preobs prep_couplo4
prep_initcond restart_999 rsbias_mklinks run_parallel sample_svs sekf_sm soilana
ssaana sstana surface_model.ksh update_ensemble_metadata update_rstrhbias
var_include varconsts vardata

oce/storm

sens/J7.sms J9.sms j1s0.sms j1s3.sms j3s0.sms j5s3.sms m1.sms

sms/BCSST.sms archivectm.sms archivectm_bc.sms archivectm_his.sms cancel.sms clean.sms compute_pp_cost.sms copetools.sms createfws.sms eda_mean.sms enkf_build.sms eppes_logs.sms fc_sens_prepare.sms fc_sens_save.sms flush.sms gen_pertpar.sms gen_pertpar_nam.sms get_aeolus.sms getfcdata.sms getini.sms getiniLeg.sms getobsSST.sms getpersSST.sms getsst.sms getvarepsdata.sms hl.sms ifs.sms ini_pertpar.sms inidata.sms inidata_paral.sms intHtoL.sms kpp_tools.sms libblackdummy.sms libnemocoup.sms libs.sms links.sms ma_tools.sms mc_tools.sms mkdir_edaeps.sms ml.sms model.sms modeleps.sms modeleps_nemo.sms modeleps_tidy.sms nemo_tools.sms oml.sms omlini_nemo.sms oops_ifs.sms oopslib.sms p4setup.sms pertinic.sms pl.sms prep_chem.sms prep_couplo4.sms prep_tcyc.sms prepdata.sms pt.sms pv.sms rain.sms remove_wsclient.sms rmfdb.sms rot.sms sfc.sms stage_eda.sms stagesst.sms subspace.sms sv.sms targets.sms tcyc_tools.sms trans_an.sms user.sms wamabs.sms wambuoycol.sms wamcleanfdb.sms wamobs.sms wamuracol.sms wavesave.sms wavfcdata.sms wavini.sms wcold.sms wipefdb.sms wkstlib.sms

sms_an/4dvar.sms Aeolus_AMD_ifstraj.sms a2o_conv.sms a2o_surf_conv.sms aeolus.sms af.sms anil.sms anml.sms anpl.sms ansfc.sms anwave.sms archive_obsgroup.sms archive_satim.sms asci2odb.sms b2otools.sms biassave.sms black.sms cmaobs.sms convert_obsgroup.sms cope_obsgroup.sms copyodb.sms ctm_files.sms eda_err_save.sms emiskf.sms enkf_ecfs.sms enkf_inflate.sms enkftask.sms ens_cal.sms ens_errors_rad.sms ens_fetch_fields.sms ens_stats_gather.sms fdbksave.sms fetch_jb_fields_mem.sms fetcherr.sms fetchmars.sms fetchmarsodb.sms fetchobs.sms fetchorbpre.sms forceinv.sms geomaps_mhs.sms geomaps_reo3.sms getxb.sms hovmoeller_mhs.sms hovmoeller_reo3.sms ifstsave.sms lowres.sms mergebufr.sms mergeodb_formats.sms monitoring.sms monthlyMean_macc.sms o2o_conv.sms o2o_surf_conv.sms obstat.sms obstat_archive.sms odb1odb2.sms odb22odb_era.sms odb2odb1.sms odbtools.sms pgeomaps_reo3.sms phovmoeller_reo3.sms pobstat.sms postenkf.sms postenkf1.sms pre1crad_iasi.sms pre1crad_iasi_split.sms pre1crad_screen.sms preCleanFDB.sms preaeolus.sms preascii.sms pregbrad.sms pregeos.sms premodb.sms premwimg.sms preobs.sms preraingg.sms prereo3.sms prescat.sms presmos.sms pscatter_reo3.sms sarinv.sms satimbin.sms satrad.sms scat.sms scatter_mhs.sms scatter_reo3.sms simulobs2odb.sms slwet.sms ssaabs.sms ssaana.sms sst.sms stdev.sms surface_an.sms update_psbias.sms update_rstrhbias.sms vardata.sms wamana.sms web_update.sms

sms_era/check_fail_traj.sms integrals_ml.sms monthlyMean.sms obtime.sms plotIntegrals.sms plotPlev.sms plotSurf.sms set_tstep.sms xsectIncrements.sms

sms_oc/checkdate_sst.sms cleantc.sms cpmodel_nemo.sms icp_arc.sms ocwavfcdata.sms ocwavini.sms sc_tools.sms tcyc.sms

sms_osm/archive_an.sms archive_fc.sms archive_flx.sms create_forcing.sms create_init_clim.sms prepare_an.sms prepare_fc.sms prepare_flx.sms surf.sms surface_model.sms

wav/archive_wave wave_altcol wave_bsdcol wave_const wave_cpini wave_find_stream wave_-getalt wave_getcurrent wave_getobs wave_getrst wave_newverify wave_run wave_set_-config wave_set_tstep wave_setgflag

Files modified(SSA):

plot/fdb_output.F90

sub/feedback_odb.F90 ice_analysis.F90

util/equsolve.F90

Files modified(TRANS):

module/ftinv_ctl_mod.F90 ftinv_ctlad_mod.F90

Files modified(WAM):

Alt/raccon.F urapre.F urasor.F

Sar/decouwa.F decowvs.F ers1sar.F invcon.F uwapre.F wvscheck.F wvspre.F

Wam_oper/chief.F getwnd.F grfield.F90 grib2wgrid.F implsch.F initmdl.F outbs.F preset_wgrib_template.F readwind.F rfl4wam.F90 updnemofields.F wamwnd.F wvalloc.F wvdealloc.F

module/yowmean.F

Glenn Carver and Mats Hamrud - nagc_CY40R1_mplcleaning - BR

Improvements to MPL modules

The mpl modules in ifsaux/module were subject to a number of changes:

1. Improve use of PRIVATE/PUBLIC in mpl_*_modules used by mpl_module.F90. A number of these modules did not use PRIVATE and were allowing IFS to access variables from modules used by mpl_-module. The code was changed so that all MPL modules now have PUBLIC and PRIVATE statements and where IFS code made use 'leaked' variables, these were added to the ONLY clause for the mpl_-module. Note now only mpl_data_module and mpl_mpif do not have private statements.
2. To be consistent with only requiring 'USE mpl_module', the mpl_data_module was added to mpl_module and 'USE MPL_DATA_MODULE' changed to 'USE MPL_MODULE' wherever it occurs in IFS.
3. Add mpl_*_modules into mpl_module. Some relatively new mpl modules, such as mpl_comm_free, were not USEd by mpl_module but directly by the IFS code.
4. Add new mpl modules to mpl_module.F90 Modules not included are mpl_mpif.h and mpl_stats.F90. Note mpl_mygatherv_mod.F90 is only referred to in the wam model and mpl_setdflt_comm_mod is only used in the prepdata programs and the wam model.
5. Modify IFS code where necessary to USE mpl_module in place of modules USEd by mpl_module.F90. Exceptions are mpl_mpif.h and mpl_stats.F90. Note a number of files needed altering because they expected to obtain variables from OML_MOD through the MPL_MODULE e.g. see pre_prsta.F90.
6. Changes to mpl_recv/send for Cray. Some module routines had already been changed to pass first element of PBUF and include a check for an incoming zero sized array. Similar changes to rest of module procedures were made. Note that in mpl_broadcast it is not safe to do this for mpl_broadcast_real8 as this causes incorrect results in 4dvar. A comment was added to mpl_broadcast.
7. Test for contiguous buffer. Some mpl modules included a test for a contiguous incoming buffer and would print a error and abort if this is the case. Changes were: a. Add test to remaining module procedures. b. Check and corrected the contiguous test to ensure that the byte size (4 or 8) was always kind jpib as this test doesn't work reliably as addresses can be greater than integer*4.
8. Fix for unassigned variable in mpl_message_mod.F90.
9. Correct mpl_init_mod.F90 for Cray where ncpus_per_task is set to control the number of FDB writers per node. Some hardwired numbers are present based on the hostname. Code now tests environment variable EC_TASKS_PER_NODE (on Cray only) and falls back to hardwired values based on hostname if environment variable not found.

Files modified(ALGOR):

```
module/control_vectors_data_mix.F90
```

Files modified(IFS):

```
dia/wrgathflnm.F90
io_serv/io_serv_open.F90 io_serv_reclaim_buf_space.F90 io_serv_recv.F90
io_serv_send.F90 io_serv_suiosctmpl.F90
module/diwrspec_mod.F90 wrfldcw_mod.F90
nemo/couplnemo.F90 getnemo.F90 ininemo.F90
obs_preproc/pre_prsta.F90
parallel/diwrgridalltoall.F90
```

Files modified(IFSAUX):

```
module/grib_api_interface.F90 mpl_abort_mod.F90 mpl_alltoallv_mod.F90
mpl_arg_mod.F90 mpl_broadcast_mod.F90 mpl_buffer_method_mod.F90
mpl_close_mod.F90 mpl_comm_create_mod.F90 mpl_comm_free_mod.F90
mpl_comm_split_mod.F90 mpl_init_mod.F90 mpl_ioinit_mod.F90
mpl_locomm_create_mod.F90 mpl_message_mod.F90 mpl_module.F90 mpl_open_mod.F90
mpl_read_mod.F90 mpl_recv_mod.F90 mpl_send_mod.F90 mpl_setdflt_comm_mod.F90
mpl_stats_mod.F90 mpl_testsome_mod.F90 mpl_write_mod.F90 prism_dummy_mod.F90
support/dr_hook_procinfo.F90
utilities/get_proc_id.F90
```

Files modified(ODB):

```
lib/mpi_wrapper.F90
```

Files modified(OOPS):

```
ifs/model/mpi_wrapper.F90
```

Files modified(PREPDATA):

```
mc_tools/svgp2sp.F90 svsp2gp.F90
module/svgg.F90
programs/Fieldset_Diff.F90 GH_RH.F90 Spread_Skill_Time_Avg.F90 Wavelet_Filter.F90
genlatmu.F90 gptosp.F90 sptogp.F90 sqrt.F90 unbal_eda.F90 uvtovod.F90 vod2uv.F90
```

Files modified(WAM):

```
Wam_oper/initnemocpl.F mpdecomp.F updnemofields.F wvwaminit.F
```

Karim Yessad and Deborah Salmond - das_SB40R1_Karim - not-BR

Replace GPPRE or GPPREH+GPXYB+GPPREF with GPHPRE

Expts: control=g1nf, test=g1sa

Files modified(IFS):

```
adiab/gpstress.F90
chem/chem_massdia.F90
climate/cormassdry.F90
control/tracmf.F90
fullpos/specfitg.F90
obs_preproc/gefger.F90
```

phys_ec/aer_clim.F90 aer_climg.F90 aer_climz.F90 aer_clist.F90 aer_stratcl.F90
ec_phys.F90 ec_phys_ad.F90 ec_phys_tl.F90 heldsuarez.F90 radcfg.F90 suphec.F90
prism/couplo4_grg_input.F90 couplo4_grg_stats.F90
setup/suspecg2.F90
var/estsig.F90 pregprh.F90 suinfce.F90

John Hague - da0j_CY40R1_RTTOV_Fix - BR

Fix for SEGV in rttov_boundaryconditions*.F90 routines

Specific allocates have been replaced with automatic allocations in the header definitions of the boundarycondition routines. This removes an intermittent SEGV in the 2nd minimisation on the Cray

Routines modified are:

Files modified(SATRAD):
rttov/mw_scatt/rttov_boundaryconditions.F90 rttov_boundaryconditions_ad.F90
rttov_boundaryconditions_tl.F90 rttov_eddington.F90 rttov_eddington_ad.F90
rttov_eddington_tl.F90