NWP test suite

Andrea Montani,
Arpae Emilia-Romagna Servizio IdroMeteoClima, Bologna, Italy

COSMO WG6

Outline

- **Introduction to COSMO NWP test suite**

- **Present status and open issues**

NWP test suite

Goals of NWP test suite

- Build up a software environment to perform carefully-controlled and rigorous testing with calculation of verification statistics for any COSMO model test - version

- Offer necessary information on the model forecasting performance

- Provide the COSMO community with standards against which the impacts of new developments in the model should be evaluated.

- Benchmark to monitor the progress of mesoscale forecast improvement (periodic testing as COSMO evolves).

Old status of the suite (installed at ECMWF)

- The suite is implemented to test the present version of COSMO (e.g v5.01) and the experimental one (e.g. v5.03) for 2 months (January 2013 and July 2013) **at 7 km (40 ML, fc+72h, starting at 00UTC) .**

- Both initial and boundary conditions are provided by ECMWF HRES (no nudging):

HRES ➜ COSMO@7p0

- As for observations, synop reports from a domain covering most of Europe and the Middle East are used (**about 3600 stations x day**).

- Output fields are stored on ECMWF ecfs and provided to Versus (also installed at ECMWF) for the comparison of the 2 model versions with the computation of scores and plots.

New status of the suite (installed at ECMWF)

- The suite has been upgraded to test the present version of COSMO (e.g v5.03) and the experimental one (e.g. v5.04a) for 2 months (January 2013 and July 2013) **at both 7 km (40 ML, fc+72h) and 2.8 km (50 ML, fc+48h), always starting at 00UTC.**

- Both initial and boundary conditions are provided by ECMWF HRES (no nudging):

  HRES ➔ COSMO@7p0

  HRES ➔ COSMO@2p8

- As for observations, synop reports from a domain covering most of Europe and the Middle East are used (**about 3600 stations x day**).

- Output fields are stored on ECMWF ecfs and provided to Versus (also installed at ECMWF) for the comparison of the 2 model versions with the computation of scores and plots <u>at both resolutions</u>.

Activity during the COSMO year

- **September-October-November 2015**

    - Test of COSMO v5.03 and comparison against v5.01 at 7 km.

    - 2.5 months were taken to run the experiments, perform verification on Versus, produce the report: TOO LONG!

    - Some critical issues were raised and room for improvement in some areas was identified.

- **May-June 2016**

    - Test of COSMO v5.04a and comparison against v5.03 **at both 7 km and 2.8 km**

    - "Misunderstanding" on the setting of the namelists to be used at 2.8 km ... The runs were almost useless (some "hot" emails at the end of June), BUT

    - we were much faster than before!!!

NWP METEOROLOGICAL TEST SUITE:
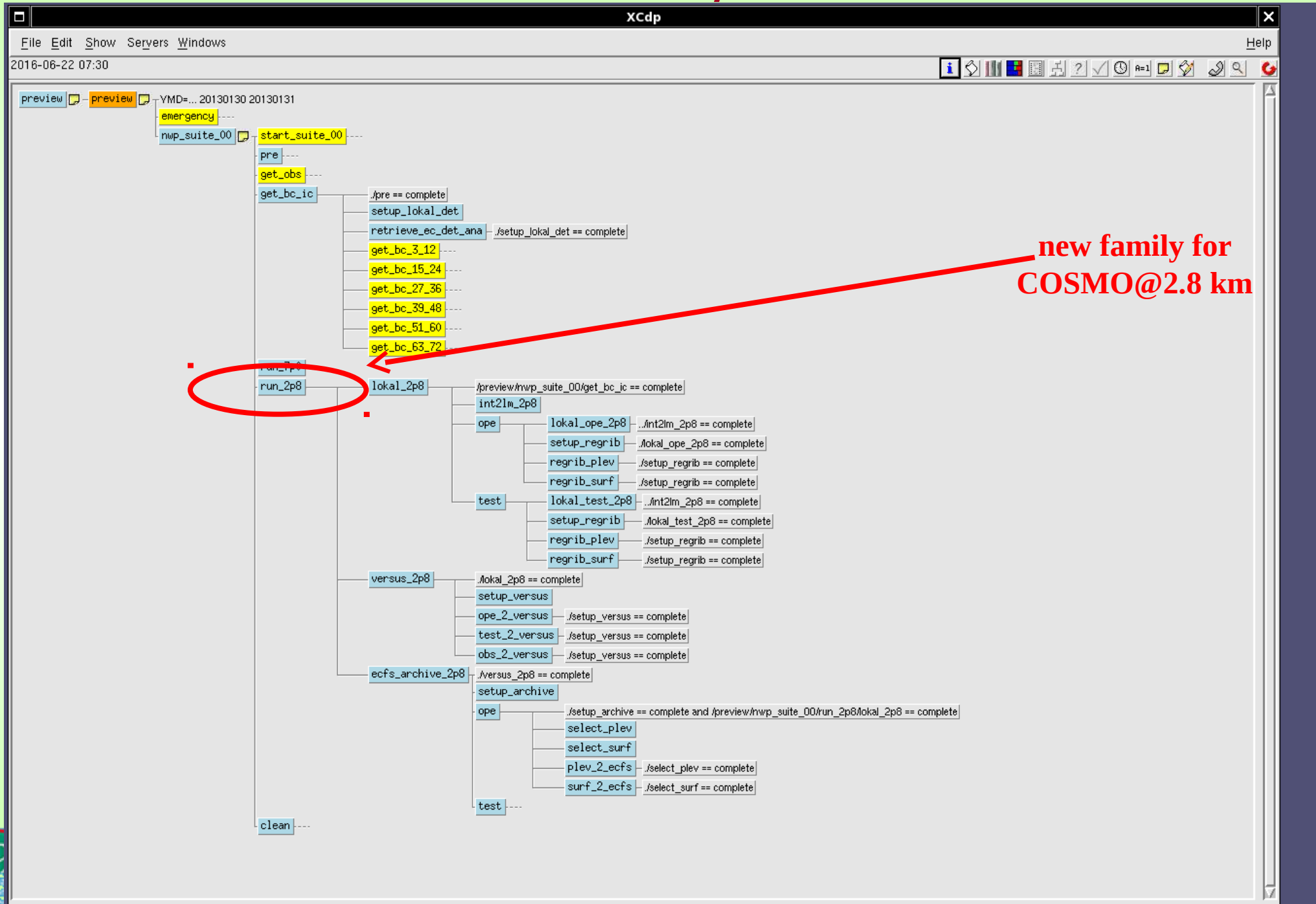
integration domain (for both 7 and 2.8 km)
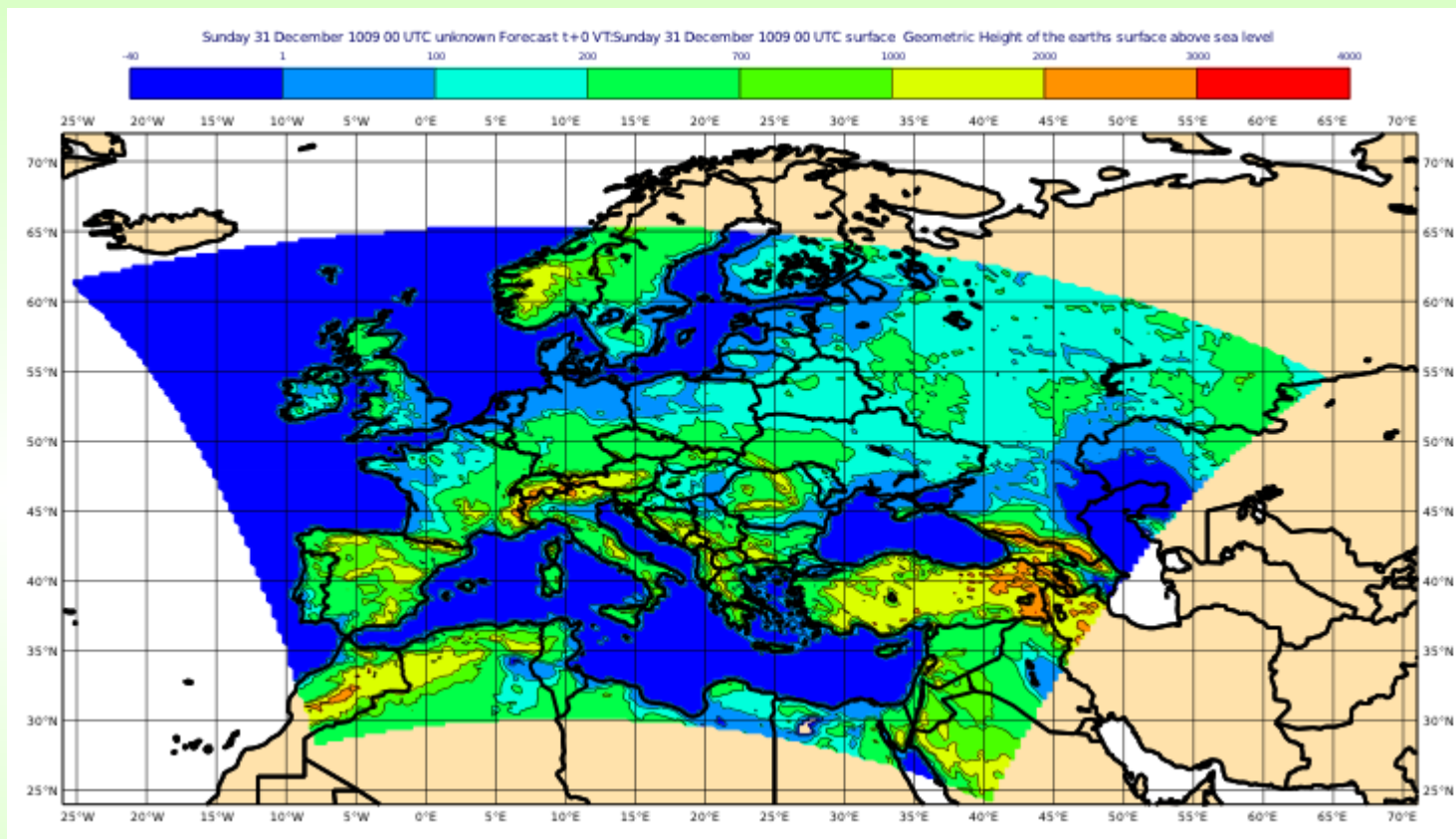
ECMWF HRES: ec_nx = 801; ec_ny = 401; 137 ML; ec_dlon = ec_dlat = 0.125 (**14 km**); fc+72h

COSMO@7p0: ie_tot = 745 ; je_tot = 569; 40 ML; dlon = dlat = 0.625 (**7 km**); fc+72h

COSMO@2p8: ie_tot = 1799 ; je_tot = 1369; 50 ML; dlon = dlat = 0.025 (**2.8 km**); fc+48h

Screenshot of the suite with its main families/tasks

Performances and costs at *7p0* and 2p8

int2lm

Interpolation for COSMO-5.04a   (HRES --> COSMO@7.0) 330 sec , 43 SBU
total_tasks and node for int2lm (@7p0): EC_total_tasks=36, EC_nodes=1

Interpolation for COSMO-5.03   (HRES --> COSMO@2.8) 864 sec, 278 SBU
Interpolation for COSMO-5.04a   (HRES --> COSMO@2.8) 864 sec, 278 SBU
total_tasks and nodes for int2lm (@2p8): EC_total_tasks=72, EC_nodes=2

COSMO

COSMO-5.03 @7.0   928 sec, 2993 SBU
COSMO-5.04a @7.0   "   "
total_tasks and nodes for COSMO (@7p0): EC_total_tasks=720, EC_nodes=20

COSMO-5.03   @2.8   6616 sec, 38417 SBU
COSMO-5.04a @2.8   6145 sec, 35682 SBU   (COSMO@2.8 km is very expensive!)
total_tasks and nodes for COSMO (@2p8): EC_total_tasks=1296, EC_nodes=36

Open issues

Room for improvement:

⋅ The full chain of the COSMO NWP suite is rarely run (mostly, twice a year); every time, you need to remember what you did last time. The suite requires the involvement of COSMO scientists working in 6 different institutions (DWD, Arpae-SIMC, ARPA-Piedmont, COMET, NMA, HNMS).

  ⋅ good side: example of collaboration and synergy of expertise within COSMO;

  ⋅ bad side: coordination of work is extremely difficult and timeliness remains a dream...

Shortage of Billing Units in ECMWF Special Project (SPITRASP):

⋅ In May-June 2016, ECMWF upgraded the processors of the super-computers. COSMO is about 1.5 more expensive on the new processors (we could not know this last year!). We have already spent 4.8 million BUs out of the 5.0 millions allocation for 2016.

  ⋅ On 24/8, we applied for extra-resources to test next model release.