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Republic Hydrometeorological Service of Serbia
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Operational short range NWP at Republic Hydrometeorological Service of Serbia

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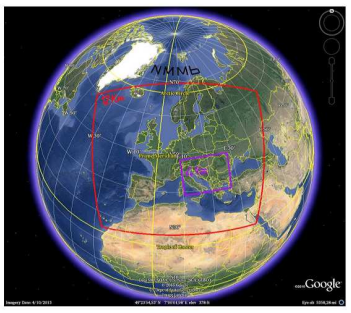
Operational running of NMMB global and regional

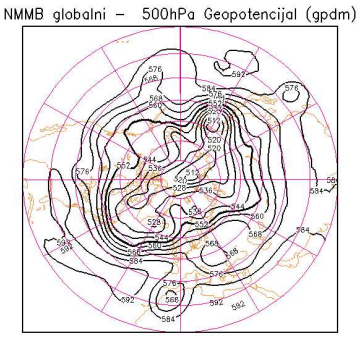
NMMB (Nonhydrostatic Multiscale Model on B grid) inside NEMS. The NOAA Environmental Modeling System (NEMS) is a common modeling framework whose purpose is to streamline components of operational modeling suites at NCEP. NEMS architecture is based on the Earth Modeling System Framework (ESMF).

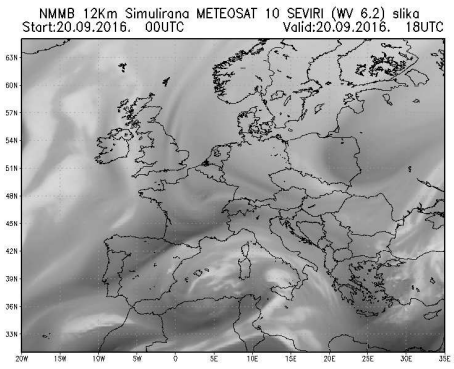
Further evolution of WRF Nonhydrostatic Mesoscale Model NMM.

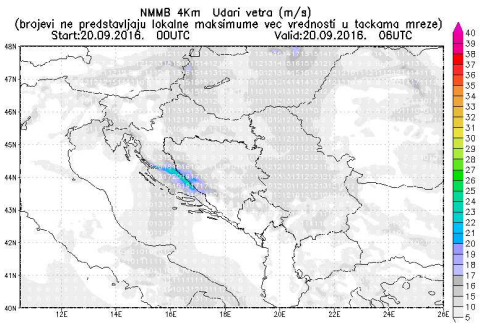
NMMB can be run on global and regional domains. Nesting is possible for regional version.

Global NMMB is operational in RHMSS from 2011. Regional NMMB on 12km horizontal resolution from 2013, nested on 4km horizontal resolution from 2015. Nested version is running with full nonhydrostatic equation system







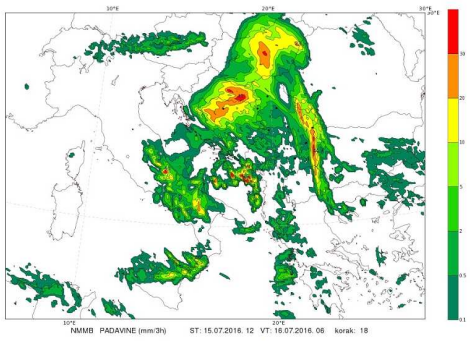


Regional NMMB installed and run operationally on ECMWF computer recourses

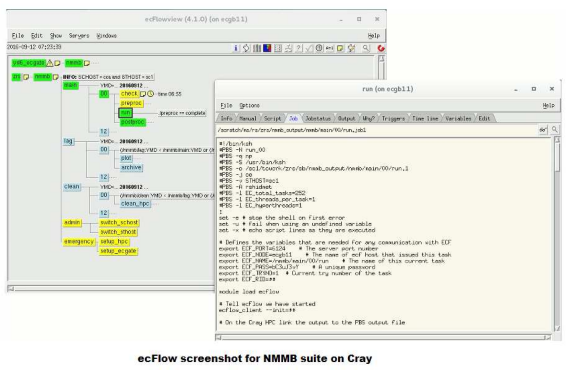
During 2016 NMMB regional model was installed on ECMWF Cray supercomputer. Test period of model running started in February 2016. Model runs on IFS BC on 252 processors, postprocessing and MetView graphics are performed on ecgate. Regional NMMB is included in ecFlow job scheduler in April 2016 and from August 2016 the model is installed on operational account on Cray in order to provide operational suite for critical time application in ECMWF.

Domain of regional NMMB on Cray

512x390 numerical points on 4km 64 vertical levels for 72 hours forecast running twice a day.



NMMB precipitation forecast



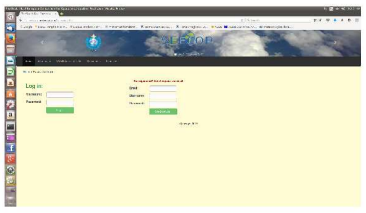
ecFlow screenshot for NMMB suite on Cray

Providing Boundary Conditions for SEECOP Consortium members

The South-East European Consortium for Operational weather Prediction (SEECOP) was established at the first Consortium meeting in March 2015, following the interest of several countries in the region to collaborate in the field of operational numerical weather prediction and corresponding technical and scientific support. The SEECOP Consortium agreement was approved by members in October 2015.

The major objective of SEECOP is to provide its Members with a state-of-the-art NWP system based on the application of the Non-hydrostatic Multiscale Model on the B grid (NMMB model) developed by NCEP (major developer: Dr. Zavisa Janjic), both for research and development activities and for operational usage in meteorological and hydrological forecasting, other applications driven by the atmosphere, and corresponding warning services.

NMMB global products for SEECOP members are available on the site http://seecop.meteo.co.me/forecast.php



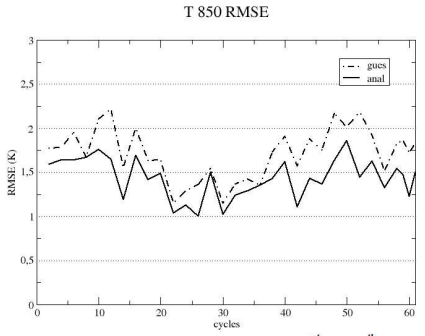
LETKF-NMMB, Hybrid EnVar-NMMB data assimilation (for 12km and 4 km model resolution)

Hybrid EnVar-NMMB data assimilation runs on ECMWF Cray from February 2016 on 12km resolution and changed to 4km from August 2016. Motivation is an improvement of a short range forecast, first 12h. System is combination of Local Ensemble Transform Kalman Filter (Hunt, et, all, 2007.) LETKF and 3DVar algorithms. Uses all types of conventional data, satellite wind measurement (SATWND) and radiance from: AMSUA, IASI, HIRS4, MHS, AIRS, CRIS, ATMS, and SEVIRI.

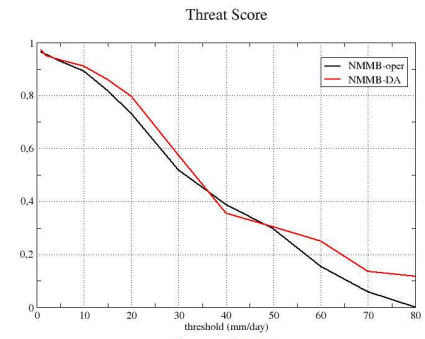
NMMB runs on horizontal resolution of 4km and multi-physics within 50 ensemble members where LBC are extracted from ECMWF EPS. Preliminary tests show encouraging results and indicate that including observations directly into regional model gives significant improvement even without inclusion of additional observations (Data that NCEP uses in global DA).

Operational suite – every 6 hours.

Work continues toward including additional high resolution data expecting further improving of short range forecast. First steps in extending to 4D EnVAR have been already performed.

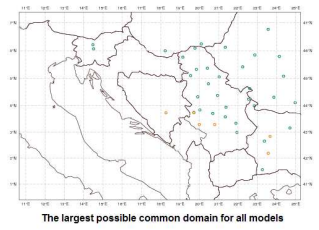


RMSE 850hPa temperature as a function of assimilation cycle 1st July to 17th July 2016

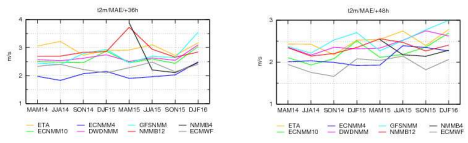


Threat score for the rain episode 14th July to 17th July 2016 (280 stations in the model domain

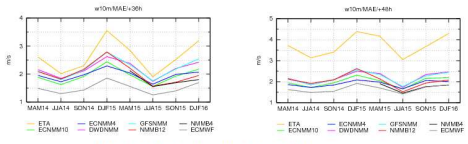
Verification of operational NWP models in RHMSS



The largest possible common domain for all models



MAE of the 2 meter temperature for 36h and 48h forecast



MAE of the 10m wind speed for 36h and 48h forecast