HMCR Model Description

Name: HMCR Ensemble

The S2S database contains real-time forecasts from HMCR from 1st January 2015, and the associated re-forecasts.

1. Ensemble version

Ensemble identifier code: RUMS

Short Description: Global ensemble system that simulates initial uncertainties using breeding method. It is based on 20 members, run weekly (Wednesday at 00Z) up to day 61.

Research or operational: Operational

Data time of first forecast run: 07/01/2015 (for current version)

2. Configuration of the EPS

Is the model coupled to an ocean model ? No

If yes, please describe ocean model briefly including frequency of coupling and any ensemble perturbation applied: -

Is the model coupled to a sea Ice model? No - Sea ice initial conditions are persisted up to day 15 and then relaxed to climatology up to day 45.

If yes, please describe sea-ice model briefly including any ensemble perturbation applied: -

Is the model coupled to a wave model? No

If yes, please describe wave model briefly including any ensemble perturbation applied: -

Ocean model: -

Horizontal resolution of the atmospheric model: 1.125x1.40625 degrees lat-lon.

Number of model levels: 28

Top of model: 5 hPa

Type of model levels: sigma

Forecast length: 61 days (1464 hours)

Run Frequency: weekly (Wednesday 00Z up to May 2017, Thursdays 00Z since June 2017)

Is there an unperturbed control forecast included?: Yes

Number of perturbed ensemble members: 19

Integration time step: 36 minutes

3. Initial conditions and perturbations

Data assimilation method for control analysis: 3D Var

Resolution of model used to generate Control Analysis: 0.5 degrees

Ensemble initial perturbation strategy: Breeding perturbations added to control analysis

Horizontal and vertical resolution of perturbations: 1.125x1.40625 degrees lat-lon.

Perturbations in +/- pairs: No

4. Model Uncertainties perturbations:

Is model physics perturbed? No

Do all ensemble members use exactly the same model version? Yes

Is model dynamics perturbed? No

Are the above model perturbations applied to the control forecast? – No

5. Surface Boundary perturbations:

Perturbations to sea surface temperature? No

Perturbation to soil moisture? No

Perturbation to surface stress or roughness? No

Any other surface perturbation? No

Are the above surface perturbations applied to the Control forecast? No

Additional comments -

6. Other details of the models:

Description of model grid: Regular lat-lon grid, sigma-coordinate in vertical.

List of model levels in appropriate coordinates: .0001, .0092, .01935, .03234, .04904, .06975, .09376, .12045, .15003, .1837, .2231, .2692, .3204, .3751, .4321, .4905, .5503, .6101, .6692, .72532, .77773, .82527, .86642, .90135, .93054, .95459, .97418, .99, 1.0

What kind of large scale dynamics is used? Finite-difference semi-implicit semi-Lagrangian, vorticity-divergence formulation (Tolstykh, JCP 2002; section 2 in Shashkin, Tolstykh, GMD 2014)

What kind of boundary layer parameterization is used? pTKE scheme (Geleyn, J.-F., et al 2006) with shallow convection included

What kind of convective parameterization is used? Bougeault (MWR 85), Ducrocq and Bougeault (95), Gerard and Geleyn (QJ 2005)

What kind of large-scale precipitation scheme is used? (Geleyn et al 1994)

What cloud scheme is used? Xu-Randall (JAS 96), diagnostic

What kind of land-surface scheme is used? ISBA

How is radiation parametrized? Ritter, Geleyn (1992), Geleyn et al (2005)

Other relevant details?

7. Re-forecast Configuration

Number of years covered: 26

Produced on the fly or fix re-forecasts? On the fly

Frequency: Produced on the fly once a week to calibrate the Wednesday 00Z real-time forecasts. The re-forecasts consist of a 10-member ensemble starting the same day and month as the Wednesday real-time forecasts for the years 1985-2010.

Ensemble size: 10 members

Initial conditions: quasiassimilation with ERA Interim data

Is the model physics and resolution the same as for the real-time forecasts: Yes

If not, what are the differences: N/A

Is the ensemble generation the same as for real-time forecasts? Yes

If not, what are the differences: N/A

Other relevant information:

HMCR re-forecasts are produced on the fly. Every week a new set of re-forecasts is produced to calibrate the real-time ensemble forecast of the given day. The ensemble re-forecasts consist of a 10-member ensemble starting the same day and month as a Wednesday real-time forecast, but covering 1985-2010 years. The re-forecast dataset is therefore updated every week in the S2S archive.

8. References:

Description of the model and its parameterizations

Tolstykh M. A. Global semi-Lagrangian numerical weather prediction model, FOP, Obninsk, Moscow, Russia, pp. 111, 2010 [Russian]

Dynamics is presented in sections 2.1 and 2.2 in V. V. Shashkin and M. A. Tolstykh, Inherently mass-conservative version of the semi-Lagrangian absolute vorticity (SL-AV) atmospheric model dynamical core, Geosci. Mod. Dev. 2014 V 7 P 407-417.

Parameterizations:

L.Gerard, and Geleyn J.-F., 2005: Evolution of a subgrid deep convection parametrization in a limited area model with increasing resolution. Quart. J. Roy. Meteor. Soc., 131, 2293–2312.

Catry, B., Geleyn J.-F., F. Bouyssel, J. Cedilnik, R. Brožková, M. Derková and R. Mladek, 2008: A new subgrid scale lift formulation in a mountain drag parameterisation. Meteorologische Zeitschrift, 17, pp. 193-208.

Noilhan, J. and Planton S., 1989: A simple parameterization of land surface processes for meteorological models. Mon. Wea. Rev., 117, pp. 536-549.

Ritter B. and Geleyn J.-F., 1992: A comprehensive radiation scheme for numerical weather prediction models with potential applications in climate simulations. Mon. Wea. Rev., 120, pp. 303-325.

Geleyn J.-F., Fournier R., Hello G. and Pristov N., 2005: A new bracketing technique for flexible and economical computation of thermal radiative fluxes, scattering effects included on the basis the Net Exchanged Rate (NER) formalism. WGNE ‘Blue Book’ 2005, pp. 4/7-8.

Brožková R., Derkova M., Bellus M., Farda A., 2006: Atmospheric forcing by ALADIN/MFSTEP and MFSTEP-oriented atmospheric tunings. Ocean Sci., 2, pp. 113–121.

Geleyn J.-F., Váa F., Cedilnik J., Tudor M. and Catry B., 2006: An intermediate solution between diagnostic exchange coefficients and prognostic TKE methods for vertical turbulent transport. WGNE ‘Blue Book’ 2006, pp. 4/11-12.

Some results of the extended range forecasts:

Tolstykh M.A., Diansky N.A., Gusev A.V., Kiktev D.B., 2014: Simulation of seasonal anomalies of atmospheric circulation using coupled atmosphere–ocean model. Izvestiya, Atmospheric and Oceanic Physics, Vol. 50, No. 2, pp. 111–121.