SESSION: (A2) Modelling issues in S2S prediction

(A2-03)

Development of a Unified Forecast System at NCEP for S2S Prediction

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NCEP's mission for S2S prediction requires developing a successor model to the present operational CFSv2. For several years, a concerted effort has taken place, both internal and external to EMC/NCEP, to create the infrastructure of a multi-component global coupled system in the NEMS framework. At the present time, the atmospheric spectral GSM is coupled with the MOM5.1 ocean model and the CICE5 seaice model. The land surface model is still internal to the GSM. This configuration will change when the spectral dynamics will be replaced by the FV3 dynamic core and the ocean model will be upgraded to MOM6. A verification module has been developed to validate the UFS as it evolves and converges to its final configuration. This module consists of making 144 35-day forecasts from the 1st and the 15th of each month, over a 7-year period from April 2011 to March 2018. Calibration climatologies are first prepared for all variables that are studied by fitting four harmonics and the mean to the model time series, as well as to the matching observed time series used for verification. Some of the variables studied are z500, SST, T2m and PRATE, as well as U850, U250 and OLR to study MJO prediction. Forecasts of the various configurations and the control operational CFSv2 are compared in terms of RMSE and AC, both with and without systematic error correction (SEC). Special emphasis is given to NH Z500, US-land T2m and PRATE verified against CPC-'daily' observations, and SST and PRATE for the Nino3.4 area. Preliminary results show that the new system with MOM6 and CICE5, without any type of tuning, is equal or better than the control operational CFSv2 over the last 7 years.

In the near future, the final configuration, which may include the Wavewatch-III for waves, GOCART for aerosols and Noah-MP for the land surface, will be fine-tuned for optimal performance, especially with regard to the physics parameterizations of convection, radiation, microphysics and clouds and the coupling between the different components. The verification module described above will help guide the rapid development of the UFS as it can be executed quickly to get interim assessments. Beyond such first steps, many more integrations to build an ensemble, covering longer forecast ranges, using more frequent initial states and many more years will be required. A weakly coupled DA system of all the components is also being developed to provide initial states for the UFS. A complete Reanalysis from 1979 to the present and subsequent Reforecasts of the system will also be carried out to provide stable calibration and skill estimates of the system before it is made operational at NCEP.