International workshop on seasonal to decadal prediction
Toulouse, France, 13-16 May, 2013

Multiple Ocean Analysis Initialization for Ensemble ENSO Prediction using NCEP CFSv2

Bohua HUANG

Center for Ocean-Land-Atmosphere Studies and George Mason Univeristy, USA,
huangb@cola.iges.org
Jieshun Zhu, Lawrence Marx, James L. Kinter III, Magdalena A. Balmaseda, Rong-Hua Zhang, and Zeng-Zhen Hu
Presenter : Bohua Huang

The impact of ocean initial condition (OIC) uncertainty on the seasonal prediction skill in the tropical Pacific Ocean is examined. For this purpose, four sets of OICs are used to initialize the 12-month hindcasts of the tropical climate for 1979 to 2007 starting from boreal spring, using the Climate Forecast System, version 2 (CFSv2), the current operational climate prediction model at the National Centers for Environmental Predictions (NCEP). These four sets of OICs are chosen from four state-of-the-art ocean analysis products, respectively produced by the NCEP and the European Center for Medium Range Weather Forecasts (ECMWF). Most of them either have been or are being used in operational seasonal predictions. In this experiment, a subset of ensemble members is generated with four different atmosphere/land initial states for each hindcast starting from a given OIC. Therefore, the ensemble hindcast with multiple ocean analyses has 16 ensemble members in total. To reduce the model initial shock and climate drift from various oceanic analyses, an anomaly initialization strategy is used for all hindcasts.

The predictive skill in the tropical Pacific Ocean is assessed based on the ensemble mean hindcasts from each individual as well as multiple oceanic analyses. The results indicate that there exists a substantial spread in the sea surface temperature (SST) prediction skill with different ocean analyses. Specifically, the ENSO prediction skill in terms of the anomaly correlation of Niño-3.4 index can differ by as much as 0.1–0.2 at lead times longer than 2 months. The ensemble mean of the predictions initialized from all four sets of ocean analyses gives prediction skill equivalent to the best one derived from the individual ocean analysis. It is suggested that more accurate OIC can improve the ENSO prediction skill and an ensemble ocean initialization has the potential of enhancing the skill and reliability at the present stage. In addition to ENSO forecast, the prediction skills of the tropical Indian Ocean SST and the US precipitation in boreal summer are also examined.