Geophysical Research Abstracts
Vol. 21, EGU2019-6372, 2019
EGU General Assembly 2019


# A study of the initialization and ensemble probabilistic forecasts of ENSO based on ensemble coupled data assimilation

Yanqiu Gao (1), Ting Liu (1), Youmin Tang (1,2)

(1) State key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography, MNR, Hangzhou, Zhejiang, China (gaoyanqiu@sio.org.cn), (2) Environmental Science and Engineering, University of Northern British Columbia, Prince George, Canada

El Niño-Southern Oscillation (ENSO) is the most prominent short-term climate oscillation on the earth but its forecast skill is still highly uncertain. In recent years, much research effort in climate prediction has been devoted to model initialization and ensemble forecast issues.
In this work, an ensemble coupled data assimilation system is established based on the Zebiak-Cane model to study the impact of initialization on ENSO prediction. The Kaplan Sea Surface Temperature Anomalies (SSTA) which order Jan 1856 to Dec 2018 and ERA-20C wind data which order Jan 1900 to Feb 2010 are assimilated into the new system for model initialization (called ensemble scheme). Then, an ensemble prediction system (EPS) is established with stochastic optimals (SOs) representing the uncertainty of physical process. Retrospective / real-time forecasts of ENSO for the period 1856 to 2019 are carried out.
Results show that, based on the ensemble scheme, the correlations of $NINO_3$.4 SSTA are improved remarkably, compared with the values based on the nudging scheme. Assimilating multi-source data yields better results than assimilating single-source data. The root mean square errors in $NINO_3$.4 SSTA are reduced, compared with the values before assimilation. So do the values in zonal wind data. In most months, observations fell in the space spanned by the ensembles. The modeled depth anomalies in upper layer along the equatorial and the modeled Te anomalies are in agreement with the observed data, respectively. Based on the EPS, the retrospective forecast skill with a 12-month lead can be up to 0.55 in past 163 years. There will be a weak El-niño event with a 95 percent probability. The prediction accuracy of each member is roughly the same. The EPS has relatively higher skill for the warm events and cold events, and it has relatively lower skill for the neutral events.