Session: C25 Poster: W01B

Tropical cyclone count forecasting using a dynamical Seasonal Prediction System: sensitivity to improved ocean initialization

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This study investigates the predictability of Tropical Cyclone (TC) seasonal count anomalies using a dynamical Seasonal Prediction System (SPS). To this aim, we performed nine member ensemble forecasts for the period 1992-2001 for two starting dates per year. The skill in reproducing the observed TC counts has been evaluated after the application of a TC location and tracking detection method to the retrospective forecasts. The SPS displays a good skill in predicting the observed TC count anomalies, particularly over the tropical Pacific and Atlantic oceans. The simulated TC activity exhibits realistic geographical distribution and interannual variability, thus indicating that the model is able to reproduce the major basic mechanisms that link the TCs occurrence with the large scale circulation. TC count anomalies prediction has been found to be sensitive to subsurface assimilation of temperature and salinity profiles in the global ocean for initialization. Comparing the results with control simulations, performed without subsurface assimilation for ocean initialization, our results indicate that assimilation significantly improves the prediction of TC count anomalies over Eastern-North-Pacific (ENP) and Northern Indian (NI) Ocean during boreal summer. For the austral counterpart, we evidenced significant progresses over the area surrounding Australia (AUS) and over Southern Indian (SI) Ocean. Our analysis shows that the improvement in prediction of anomalous TC counts follows the enhancement in forecasting daily anomalies in Sea Surface Temperature due to subsurface ocean initialization. Furthermore, the skill changes appear to be in part related to forecast differences in Convective Available Potential Energy (CAPE) over ENP and ATL, in vertical wind-shear over NI and in both CAPE and wind-shear over SI.