Applications of Data Assimilation on the Seasonal-Decadal Prediction of Coupled Models in IAP

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This work will introduce the applications of data assimilation on the seasonal to decadal prediction based on the coupled model in the institute of atmospheric physics (IAP). The motivations of data assimilation is for providing the initial conditions for models to make forecast. For the coupled model, the main issue of data assimilation is because atmospheric and Oceanic boundary layers are not dynamically balanced during the data assimilation process, and many opportunities are still remained and need to be solved. For the ocean only data assimilation scheme for the coupled model, we only assimilate the oceanic observations into the ocean model, and keep the atmospheric unchanged. This is because we believe ocean has much longer memory than atmosphere, and then the ocean model can keep the ocean observational information for a longer lead time. Two examples of the ocean only data assimilation will be introduced, one is adopting the EnOI-IAU scheme in coupled model framework – FGOALS-s2 to make the realistic seasonal-to-decadal predictions, and the other is applying the EnOI ocean assimilation into an earth system model – CAS-ESM-C to improve the simulation of the decadal shift of the eastern Asian summer monsoon (EASM). For the strongly coupled data assimilation applications, only few attempts have been made in IAP. Based on the intermediate coupled model (ICM), and due to the coupled covariance between atmosphere and ocean fields, the ENSO prediction skills are further improved by the coupled data assimilation application through correcting the the ocean velocity through assimilating the surface wind stress data in the ICM.