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Quality Control Methods in Ocean-Sea ice Coupled Data Assimilation

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The purpose of employing data assimilation methods in operational ocean forecasting systems is to provide good initialization to the models and is dependent on good quality ocean observations being assimilated. Using or accepting erroneous data can result in an inaccurate analysis and alternatively, rejecting extreme or valid data can result in missing important events.

In this study two ocean-sea ice coupled systems are considered: HYCOM-CICE4 and MOM6-CICE6 at ¼-deg horizontal resolution and 41 vertical layers. The two coupled models are initialized from the World Ocean Atlas 2018 (WOA) temperature and salinity climatology for a period of 20 years. Both models are forced with GEFS (Global Ensemble Forecast System created by the National Centers for Environmental Prediction: NCEP). The data assimilation is performed on a 24-hr cycle using RTOFS-DA (Real-time Ocean Forecasting system-DA; 3DVAR) for HYCOM-CICE4 and SOCA (Sea ice Ocean Coupled Assimilation; 3DVAR) for MOM6-CICE6 to compare the data Quality Control (QC) methods. The ocean data being assimilated include satellite sea surface temperature (SST) and sea surface salinity (SSS), in-situ temperature & salinity, absolute dynamic topography (ADT), sea ice concentration.

The QC in RTOFS-DA and SOCA are fully automated and are performed through various filters applied (e.g., land-sea area fraction to eliminate satellite data near the coast, temperature inversion elimination in in-situ profile data, etc). The various QC methods in both DA systems are described. The results of the analysis and 24-forecast are compared against independent observations and statistics of the data accepted and rejected between the two DA systems are presented and discussed.