Evaluation of the CONCEPTS Global Ice-Ocean Prediction System: Establishing a Core Environmental Prediction Capability in Canada

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Abstract:

We present results from the ¼° resolution Global Ice-Ocean Prediction System (GIOPS) developed as part of CONCEPTS (Canadian Operational Network of Coupled Environmental PredicTion Systems), in collaboration with the French operational ocean forecasting centre Mercator-Océan. GIOPS is intended to form the backbone for Canadian Marine Environmental Prediction providing much needed ice and ocean fields for a variety of applications, such as: sea ice prediction, coast guard operations (seal hunt, navigation), fisheries and aquaculture management, increased understanding of biological field observations, assessment of regional climate change impacts, risk assessment for extreme events and emergency response (search and rescue, oil spill). Particular applications at CMC include: initialization of seasonal forecasts, initial and boundary conditions for the regional METAREAs forecasting system and initial conditions for coupled atmosphere-ice-ocean forecasts.

GIOPS has been running routinely at the CMC since December 2010 producing weekly analyses and 10 day ice-ocean forecasts using the NEMO modeling system and the Mercator assimilation system. The Mercator data assimilation system is a multi-variate reduced-order extended Kalman filter that assimilates sea level anomaly, sea surface temperature (SST) and in situ temperature and salinity data. Ocean analyses are blended with ice fields from CMC daily ice analyses. Here, we present an evaluation of the global prediction system with a focus on the forecast skill of SST and sea ice concentration. An evaluation of SST forecasts using AVHRR satellite observations demonstrates a significant improvement over persistence in most regions. Results point to the marginal ice zone (MIZ) as the most difficult region to constrain adequately. Verification of ice forecast skill against NOAA IMS analyses and CMC 3DVAR ice analyses show that the system provides robust forecasting skill globally as compared to persistence. Finally, current and future developments to improve the forecasting system are discussed.