The Arctic Cap Nowcast Forecast System

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The Naval Research Laboratory has developed a two-way coupled Arctic Cap Nowcast Forecast System (ACNFS) which consists of the Los Alamos Community Ice Code (CICE), the Hybrid Coordinate Ocean Model (HYCOM) and the Navy Coupled Ocean Data Assimilation (NCODA) system. Model fields are exchanged using the Earth System Modeling Framework (ESMF). The ACNFS has a horizontal resolution of 3.5 km in the central Arctic that increases to approximately 7 km at the model's southern boundary at 40˚N. CICE has state-of-the-art ice thermodynamics, snow layers, ridging and melt pond parameterizations and the ability to forecast multiple categories of ice thickness according to World Meteorological Organization definitions. HYCOM is designed with a generalized vertical coordinate. It is isopycnal in the open stratified ocean, reverts to a terrain-following coordinate in shallow coastal regions, and uses z-levels near the surface in the mixed-layer where the water column is weakly stratified. The ACNFS data assimilation is performed using the Navy Coupled Ocean Data Assimilation (NCODA) system where the model forecast is used as a first guess. NCODA assimilates available satellite altimeter observations, satellite ice concentration, satellite and in situ sea surface temperature, in situ vertical temperature and salinity profiles for xbt's, Argo floats and moored buoys using a 3-Dimenionsal VARiational analysis (3DVAR) scheme. The ACNFS is forced with the Navy Operational Global Atmospheric Prediction System (NOGAPS) 0.5 deg atmospheric forcing. Ocean boundary conditions are provided by the Navy's 1/12 deg global HYCOM. The ACNFS has been validated by examining ice extent, ice drift, ice thickness, and ice draft versus observational data. The ACNFS is running in real-time at the Naval Oceanographic Office (NAVOCEANO) and produces a daily nowcast and 5-day forecasts of ice concentration, ice thickness, ice drift, ocean currents, ocean temperature and ocean salinity. The National Ice Center is evaluating ice products from ACNFS while NAVOCEAN is evaluating the ocean products. The ACNFS is expected to be declared "operational" during the first half of 2012.