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Validation of the 1/12° Arctic Cap Nowcast/Forecast System (ACNFS)

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The Naval Research Laboratory (NRL) has compared sea ice hindcasts for the Arctic Ocean derived from a two-way coupled ice-ocean system to observations. The system is based on the HYbrid Coordinate Ocean Model (HYCOM) coupled via the Earth System Modeling Framework (ESMF) to the Los Alamos Community Ice CodE (CICE) which has the latest ice thermodynamics improvements including updated snow layers and the ability to forecast multi-categories of ice thickness. The data assimilation capability is based on the Navy Coupled Ocean Data Assimilation (NCODA) system.

The Arctic Cap Nowcast/Forecast System (ACNFS), a subregion of a global 1/12 ° tripole grid, is configured on a 1/12° grid with resolution of ∼3.5 km near the pole. Both the ocean and ice model use the Fleet Numerical Meteorology and Oceanography Center 3-hourly 0.5° atmospheric forcing from the Navy's Operational Global Atmospheric Prediction System (NOGAPS). The lateral "open" boundaries are defined away from any sea-ice covered regions to avoid possible contamination of any forecast fields for both the ocean and ice models. A spin-up using a non-assimilative HYCOM/CICE system from 2005-2007 was used as the initial condition for the assimilative ACNFS hindcast. The simulation started in July 2007 and was run through December 2009.

NRL has validated ice drift, ice thickness, ice edge location and ice concentration (ice edge) against unassimilated observational data sets such as Arctic drifting buoy data, ice mass balance buoys, daily ice edge locations from the National Ice Center, Special Sensor Microwave/Imager (SSM/I) ice concentration data and daily WindSat ice concentration fields. Overall, the model results show good agreement to the observed real-time Arctic data.