

## Validation of the Arctic Cap Nowcast/Forecast System (ACNFS) against satellite and observational data

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The Naval Research Laboratory (NRL) has compared a sea ice hindcast for the Arctic Ocean derived from the latest coupled ice-ocean prediction 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) and tested using the Navy Coupled Ocean Data Assimilation (NCODA) system. The validation of the 1/12° Arctic Cap Nowcast/Forecast System (ACNFS) was accomplished by comparing hindcast fields to the current operational Polar Ice Prediction System (PIPS 2.0) as well as comparing to observations. Both the ACNFS and PIPS 2.0 output daily fields of ice thickness, ice concentration and ice drift. The goal of the validation is to determine if the new ACNFS is an improvement over the existing PIPS 2.0 model and should be used operationally in its place. NRL validated hindcasts and forecasts of ice edge location, ice thickness, ice draft and ice drift using independent observational data sets such as daily ice edge, ice mass balance buoys, ice drifting buoys, ice thickness survey flight data, upward looking sonar data and Special Sensor Microwave/Imager (SSM/I) ice concentration data. NRL evaluated the models against these data during the years 2007-2009 depending on the availability of the observations. Observed daily ice edge location files from the National Ice Center (NIC) were compared to ACNFS and the average ice edge error was 76 km as compared to 210 km for PIPS 2.0. This represented a 64% improvement using ACNFS.

ACNFS is running in real-time at the Naval Oceanographic Office (NAVOCEANO) and outputting a daily nowcast and 5-day forecasts of ice concentration, ice thickness, ice drift, ocean currents, ocean temperatures and ocean salinity. The NIC is currently evaluating the ice products from ACNFS while NAVOCEANO is evaluating the ocean products. The Operational Testing (OPTTEST) phase is scheduled to be complete by December 2011.

The improved physics of the sea-ice/ocean models and the significant increase in horizontal resolution of the ACNFS (3.5 km vs 27 km) has led to improved nowcasts and forecasts of ice in the Arctic region. This system will lead to improved environmental knowledge of ice conditions that will affect not only the warfighter but be valuable to potentially increased shipping that may result from passages being opened that have historically been closed with ice.

Will be presented at the 4<sup>th</sup> Symposium on the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations, June 20-22, 2011 – Navy Memorial, Washington DC.