

# **Overview of CONCEPTS Ice-Ocean Prediction Systems: From Research to Operations**

Hal Ritchie<sup>1</sup>, Greg Smith<sup>2</sup> and Fraser Davidson<sup>3</sup>

<sup>1</sup>*Environment and Climate Change Canada, Recherche en Prévision Numérique Environnementale,  
Dartmouth, NS, Canada*

<sup>2</sup>*Environment and Climate Change Canada, Recherche en Prévision Numérique Environnementale,  
Dorval, QC, Canada*

<sup>3</sup>*Department of Fisheries and Oceans, Northwest Atlantic Fisheries Centre, St. John's, NL, Canada*

As numerical weather prediction (NWP) systems become further refined, the interactions across the Air-Ice-Ocean (AIO) interface are becoming increasingly important. This is giving rise to the development of a new generation of fully-integrated environmental prediction systems composed of atmosphere, ice, ocean, and wave modeling and analysis systems.

Within the Canadian Operational Network of Coupled Environmental Prediction Systems (CONCEPTS), a fully-coupled AIO forecasting system for the Gulf of St. Lawrence (GSL) has been developed and has been running operationally at the Canadian Centre for Meteorological and Environmental Prediction (CCMEP) since June 2011. Here we present an overview of recent system developments in CONCEPTS.

We investigate the impacts of interactive coupling between the ocean and sea ice with the Global Deterministic NWP Prediction System at CCMEP. The approach optimizes the information content in respective modelling components by calculating fluxes in the ocean and sea ice models and coupling to the atmosphere at every timestep, followed by aggregation that allows an accurate estimate of heat fluxes. Moreover, the benefits from coupling are found to depend sensitively on a careful treatment of both ocean and sea ice initialization. Using this coupling framework, statistically significant improvements to global verification scores are obtained. In particular, a strong sensitivity to coupling for tropical cyclones is found with large-scale impacts on weather prediction.

We also outline the higher resolution Regional Ice-Ocean Prediction System (RIOPS) and its coupling with a higher resolution version of the Regional Deterministic NWP Prediction System in support of the Year of Polar Prediction.

The CONCEPTS Ocean Navigator provides a very flexible and user-friendly tool for accessing and displaying the outputs from this range of prediction systems.

This presentation will be made on behalf of our many colleagues in CONCEPTS.