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Ocean forecasting for Canada's east coast

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The ocean off Canada's Atlantic coast is an area of great importance for Canada's economy. Offshore industries such as fishing, marine shipping, and oil and gas production play a key role in the economic development of the maritime provinces. To conduct safe and efficient offshore operations and to respond to emergencies, timely and reliable information about ocean conditions is required. Ocean forecast models can provide short-term predictions of water level, surface currents, temperature, ice cover, waves and other oceanographic parameters. At Bedford Institute of Oceanography (BIO), a suite of numerical models have been developed for both basic research and operational research. The Princeton Ocean Model (POM) has been adapted for the coastal sea extending from Baffin Bay to the Gulf Stream and from the coast to mid-Atlantic. POM produces 3-d ocean variables. For ocean temperature, the flux correction method is used to assimilate sea surface temperature data into the model. The model outputs combined with tide predictions from a tide model give forecast water level and currents. For sea-ice, a multi-category sea-ice model coupled to POM is used for ice concentration and thickness. A spectral wave model for the northwestern North Atlantic provides wave height and direction forecasts. Meteorological parameters used for atmospheric forcing are obtained from Meteorological Service of Canada, which are generated from a weather forecast model on a 24 km grid at 3 hourly intervals. The integrated operations of data transfer, model execution, data display and dissemination are performed from an automated ocean forecast system. The system is run daily to generate 2-day forecasts. Graphs, maps and animation of selected forecast parameters are uploaded to BIO's website at: http://www.mar.dfo-mpo.gc.ca/science/ocean/icemodel/ice_ocean_forecast.html. An important step in the development of the forecast system is model validation. Analysis of the results can lead to improvements of the forecast models. As an example, surface velocities derived from surface drifters are used for validation of surface currents. A comparison of the modeled and observed surface currents indicates that wave effects are important and should be incorporated into the model.