

Three-dimensional variational data assimilation in a coupled ice-ocean model with ensemble-derived background-error covariances

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A three-dimensional variational data assimilation (3D-Var) system has been developed to provide analyses of the ice-ocean state for coupled ice-ocean models. The study focuses on the impact of sea-ice data assimilation on the prediction of sea-ice condition. To obtain ocean state analysis increments consistent with the sea ice analysis increments and in preparation for assimilating sea surface temperature data, an ensemble estimate of the background-error covariance matrix is used and preliminary results are shown. The ice-ocean model is driven by atmospheric wind and temperature forcings. An ensemble of forecast-analysis experiments is produced by perturbing the assimilated observations and using 20 members of the atmospheric ensemble prediction system run operationally at the Canadian Meteorological Centre. Data assimilation experiments, using various configurations of the 3D-Var, are conducted over a 4-month period during the winter of 2008 in the region of the Gulf of St. Lawrence. The analysis system assimilates RADARSAT image analyses produced by the Canadian Ice Service. The impact of additionally assimilating total ice concentration retrievals (using the NASA TEAM 2 algorithm) from passive microwave observations is also examined.