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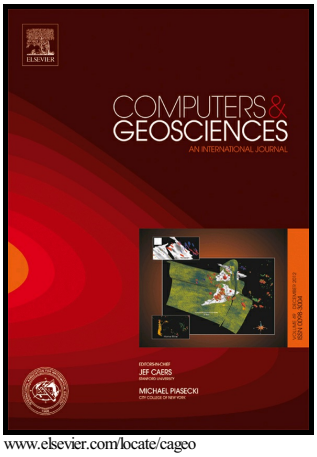

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Abstract

Accurate forecasting of coastal surface currents is of great economic importance due to marine activities such as marine renewable energy and fish farms in coastal regions in recent twenty years. Advanced oceanographic observation systems such as satellites and radars can provide many parameters of interest, such as surface currents and waves, with fine spatial resolution in near real time. To enhance modelling capability, data assimilation (DA) techniques which combine the available measurements with the hydrodynamic models have been used since the 1990s in oceanography. Assimilating measurements into hydrodynamic models makes the original model background states follow the observation trajectory, then uses it to provide more accurate forecasting information. Galway Bay is an open, wind dominated water body on which two coastal radars are deployed. An efficient and easy to implement sequential DA algorithm named Optimal Interpolation (OI) was used to blend radar surface current data into a three-dimensional Environmental Fluid Dynamics Code (EFDC) model. Two empirical parameters, horizontal correlation length and DA cycle length (CL), are inherent within OI. No guidance has previously been published regarding selection of appropriate values of these parameters or how sensitive OI DA is to variations in their values. Detailed sensitivity analysis has been performed on both of these parameters and results presented. Appropriate value of DA CL was examined and determined on producing the minimum Root-Mean-Square-Error (RMSE) between radar data and model background states. Analysis was performed to evaluate assimilation index (AI) of using an OI DA algorithm in the model. AI of the half-day forecasting mean vectors' directions