The Western Channel Observatory operational model: monitoring coastal water quality

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Introduction

Our coastal seas support a wide range of activities and provide essential services to the local, regional and national economies. Coastal observatories, in combination with governmental monitoring programs provide essential information to support science based policies and management decisions. However, these efforts can rarely encompass the range of scales at which the coastal environment operates.

Within the context of the Interreg Atlantic Area MyCoast project, PML has implemented a nowcasting and forecasting system of the Tamar estuary and adjacent coastal area that enables the contextualisation of intermittent observations.

Methods

The system consists of three components; 1) a dynamically downscaled GFS (Global Forecasting System) atmospheric short forecast that uses the WRF (Weather Research and Forecasting) model at 3km resolution, 2) a neural network river forecast calibrated against gauged flows and 3) oceanic boundary information from the latest 1.5 km resolution MetOffice ocean forecast model (NEMO) as provided by CMEMS. The hydrodynamics are resolved with FVCOM, a prognostic, unstructured-grid, finite-volume, free-surface, 3D primitive equation coastal ocean circulation model.

Results

The system has been validated in both hindcast and nowcast/forecast modes using water level, current velocities, salinity and temperature data from a variety of sources and has been found to run robustly during the test periods.

Conclusions

The operational model simulations support the implementation of lagrangian methods that highlight the key drivers of water quality in bathing areas inside the estuary and indicates that weekly routine sampling does not capture the variability of the system and can underestimate adverse water quality events.