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Dublin Bay Water Quality Modelling from Catchment to Coast

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This paper presents the development and preliminary results of a deterministic modelling system for bathing water quality assessment in Dublin Bay, Ireland. The system integrates functional capacity for simulating the transport and fate of diffuse agricultural pollutants (utilising both the NAM rainfall-runoff model in conjunction with MIKE 11), discharges from the Dublin urban drainage network (through MIKE Urban and InfoWorks software), and the ultimate fate of pollutants in Dublin Bay (coastal domain modelling utilises the 3-dimensional MIKE 3 code). The work presented forms part of the EU INTERREG funded Acclimatize project (www.acclimatize.eu) that is investigating the longer-term water quality pressures in Dublin Bay that may arise in the context of a changing climate (particularly that from predicted changes in precipitation totals and patterns). Model calibration and validation has been underpinned by extensive data collection from within the catchments discharging to Dublin Bay and from the bay area itself. Catchment data includes the observing of hydrometeorological variables for establishing relationships to measured flows and water quality at catchment and sub-catchment scales. Coastal data relates to water quality, coastal hydrodynamics (current speed and direction collected from ADCP deployments at multiple monitoring points in the bay), temperature and salinity. A nested modelling approach where the modelled domain is nested in a larger Irish Sea model has been adopted. Tidal constituents along the seaward boundaries of this nested model have been calibrated to correlate well with tidal measurements from a set of established tide gauges within the modelled domain. Bottom friction was calibrated to produce good correlations of measured and simulated current speed and direction. Preliminary results indicate that the transport of faecal indicator bacteria within the study area is adequately represented for spring and neap tide conditions.

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