



2D numerical modelling of nutrient pathways for Carmarthen Bay, Wales

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The control of nutrient pollution in coastal waters is a major concern within a sustainable catchment management. The eutrophication of water bodies causes a serious change in ecosystem stability and diversity. Algal growth (e.g. toxic cyanobacteria) and the decay of fish populations and species are known ecological responses to nutrient pollution. As a result, the tourist, shellfish and aquaculture industries have suffered economically. These problems have led to the current study of Carmarthen Bay, Wales.

The two-dimensional finite volume model HEMAT¹ was set up for the Bristol Channel with a fine grid resolution for Carmarthen Bay. The model implied the momentum and mass conservation equations for the surface flow and the advective-diffusion transport equations. The hydrodynamics were calibrated with tidal current and water level data measured at two locations in the Bay. Water quality samples were taken and analysed by the Environmental Agency Wales and used for calibration and verification of the water quality model. The formulation of nutrient dynamics and decay rates was refined from literature through a sensitivity analysis.

The aim of this study was to deepen the understanding of the transport and fate of nutrients into coastal waters with a perspective on the development of catchment management tools and to advice on sustainable agricultural and recreational land-use practices. Different scenarios and the effect of reducing diffuse and point nutrient sources were simulated with a future prospect towards a nutrient management risk model for the Bay.

¹Namin, M. M., Falconer, R. A., Mohammadian, B., Lin, B. & Kamalian, R. (2002).

Hydroenvironmental modelling and analysis tool (HEMAT), a GUI based 2DH hydrodynamic and contaminant transport model on unstructured triangular grids. Proceedings of the 5th International Conference on Hydroinformatics, Cardiff, UK.