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ADVECTION-DISPERSION MODEL FOR NUTRIENT DYNAMICS IN RIVER SWALE

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Summary. This paper presents a detailed mathematical model (ADModel) for the transport of nutrients under unsteady flow conditions in River Swale. ADModel (Table 1) offers a different and more detailed perspective of studying pollutant transport compared to many existing studies and models (e.g. QUESTOR). Existing approaches are typically based on a broad characterisation of chemical status and how it varies within large river basins. These existing models (1) represent the river as a perfect mixed tank or as a succession of perfect mixed reaches; (2) assume constant average parameters of the river/reaches; (3) make predictions at large time steps (daily); and (4) locate pollution sources and abstractions at reaches boundaries; while ADModel (1) represents the river as a continuous computational domain; (2) with variable parameters along it; (3) predicts concentration at smaller time steps (hourly); and (4) locate pollution sources and abstractions at the real place along the river.

Model	**ADModel for River Swale**
Implementation	ADE analytical solution implemented in Matlab
Pollutant release	Four continuous pollution sources; Three tributaries
Abstractions	15
Pollutants	NH_4, NO_3, SRP, OP
Transformations	Nitrification, denitrification, mineralization
Transformation rates	QUESTOR calibrated values
Parameter models	Velocity; Dispersion coefficient
Water flow	Unsteady
Inputs concentration and water flow	Pollution sources: constant Tributaries: unsteady

Table 1: Main features of ADModel.

ADModel to be useful to predict the propagation of the four nutrients at any place along the river stretch (under normal and accidental discharge) while other models predict pollutant dynamics just at reach boundaries. Study and explanation of nutrient dynamics in the river stretch in terms of the temporal variability of the nutrient transformation rates is also possible.