Integrated flow and pollution modelling at the catchment scale: the INCA models

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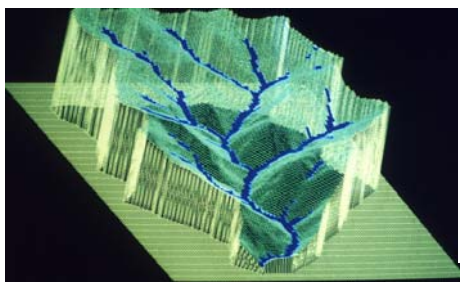
Key questions

1. Is it possible to develop process based models that work at the catchment scale?
2. What are the potential impacts of climate change on future flow and water quality?
3. What will be the impacts of land use change on flow and quality as agriculture changes due CAP reforms, the WFD and Climate Change?
4. How transferable are the models?

The INCA modelling suite

A new family of models have been developed to simulate the fate and behaviour of a range of pollutants, together with river flow and ecology.

The model group, INCA or **In**tegrated **Ca**tchment models simulate the spatial and temporal patterns of pollutant behaviour across and down river catchments.



Environmental behaviour simulated by the models include flow dynamics, the behaviour and transfer of, Nitrogen, Phosphorus, Sediment, Metals, Carbon, and Methyl-Mercury from land to water, and the ecological responses to these controls.

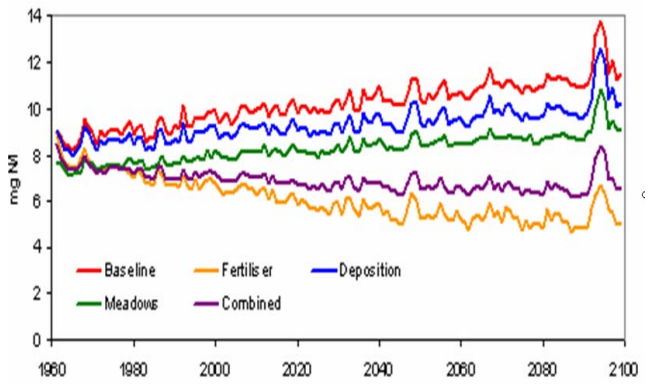
Simulation takes place at a daily time step, and at a 1km2 spatial grid resolution.

A reach cascade structure is incorporated in the model to allow simulation of the transport and transformation of pollutant load downstream and sediment: water exchange, and the consequent impact of instream loading on water quality.

Using INCA to simulate climate change impacts on N flux

INCA-N, the Nitrogen Model, has been set up for the River Kennet to investigate the impacts of Climatic Change on flow and water quality.

The figure below shows Nitrate-Nitrogen concentrations from 1960- to 2100 using outputs from the Hadley centre model to drive precipitation, temperature, evaporation and soil moisture deficit.



The model predicts increasing drought, with spikes of nitrogen following drought periods.

A set of adaptation strategies shows the range of measures necessary to mitigate the impacts of Climate Change. These include controls on Fertiliser use, land use, N deposition rates and creation of water meadows

The Eurolimpacs Project- applying INCA across Europe

Euro-limpacs is a €20m Integrated Project funded by the EU designed to assess the effects of future global change on Europe's freshwater ecosystems.

The project is co-ordinated by the Environmental Change Research Centre, University College London and has 38 partners, including Reading University and CEH. The INCA model is being used to simulate the effects of climate change on a range of pollutant flux behaviours across Europe.

The Project runs from February 2004 – 2009. Updates can be found at www.**eurolimpacs**.ucl.ac.uk/

Find out more…

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