An overview of progress in LOIS river basins

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I - Introduction

The three main aims of the LOIS river basins research are:
(1) To determine contemporary land-to-sea fluxes of water, sediment, biological matter, major dissolved constituents, nutrients and chemical contaminants.
(2) To identify and characterise the key processes governing the fluxes.
(3) To develop models to predict future fluxes resulting from changes in land use, the climate or other major perturbations within freshwater basins.

The core study catchments cover an area of more than 42,000 km^2 with more than 20% of the U.K. population and a very significant part of energy, industrial and agricultural production. Prior to LOIS most hydrological, sediment, chemical and biological studies of rivers were carried out in separate programmes. LOIS has integrated rivers science with coastal/riverine research more than has ever been possible before. With regard to river basins, monitoring of a wide range of substances from many sources through river basins, moving down to the estuaries and coast, is being carried out on an intensive basis in a large-scale network. It is possible to routinely link hydrological, sediment and pollution events for the first time. Similarly, detailed data collection is enabling scientists to enhance our understanding of river processes and to develop a range of hydrological models to predict future fluxes and how they may alter with changes in land use, industrial inputs or climate.

II - Research Activity

LOIS has created a large-scale river monitoring network to support the Core and Special Topic science extending from the Tweed to the Trent. Integrated instrumentation including automatic bulk samplers, pressure transducers, turbidity monitors and multiprobe systems (covering pH, Conductivity, temperature, dissolved oxygen depth and salinity) provide high temporal resolution data on river conditions and fluxes in close collaboration with the Environment Agency and SEPA. Telemetry systems give real time access to continuous river flow and turbidity data, which is used to plan and instigate flood event sampling. Routine weekly sediment and water chemistry sampling has been carried out from 1993 to 1997 in the Humber rivers, with adjustments to the strategy to catch high flow events from Summer 1994. CASI runs took place during June and August in 1994 and full stereo colour vertical imagery was taken during the floods of February 1995. Ground truthing work, on suspended sediment loads and water temperature profiling, was carried out during these events.

Since 1995 there has been additional effort in collaboration with RACS(C) concerning the estuarine/fluvial boundary zone research, in tidal reaches of the Ouse and Trent. This research has included joint Special Topic water chemistry studies and RACS(R) core programme CASI interpretation, flow and turbidity monitoring.

In the Tweed catchment, automatic weather stations were installed at two sites to provide climate data, in combination with measurements of atmospheric nitrogen and sulphur deposition in river basins from 1994 onwards. Suspended sediment monitoring and routine water chemistry also began in the Tweed in 1994.

With regard to the LOIS data archive a large range of data is now held at the LOIS rivers Data Centre including core programme determinations by the main CEH institutes, in addition to sewage works, river WQ and trade effluent determinations by Midlands and North East regions of the Environment Agency, water companies and SEPA. The data has been combined to provide new spatial and temporal visualisations of majors, metals and organics data. On-line access from the LOIS Data Centre to the Environment Agency is currently being developed. The contrast between the "dirty" rivers (eg. Trent, Don, Aire, Calder) and "clean" rivers (eg. Ouse, Wharfe, Nidd, Tweed) is very apparent. Results from contaminants analyses, for example, indicates that triazines are present in the Don, Trent, Aire, Calder and Ouse during each week of the sampling period. Lindane and BHC-alpha are detected also present in some streams. These results have led to additional intensive studies by Special Topic and core workers on the Swale-Ouse and Aire systems beginning in 1995, particularly to assist nutrients and micro-contaminants process studies and the development of the integrated river models.

River flow and water quality models have been tested on reaches of the Ouse above York. Model calibration and more detailed sensitivity analysis are proceeding. A large-scale physically based catchment model has been developed and applied to a series of representative catchments in Yorkshire. Further testing of the model with regard to its within-basin dynamics, potential for water quality modelling and treatment of groundwater is being carried out. Work has also progressed on models and parameters required for organics, sediment and carbon. The model development work has also led to changes in water chemistry and sediment field sampling strategies. The development of nitrate delivery models has been aided by use of satellite imagery of the Trent catchment to discriminate between classes of grassland with different nitrate leaching regimes. Advanced computing facilities are being utilised for major model runs under a range of future socio-economic and environmental scenarios extending 50-100 years.

Further detail on some aspects of this necessarily brief summary will be described further in this session and detailed Special Topic and core programme work is reported in the poster and parallel sessions.

LOIS land-ocean interaction study

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