

Integration over time

Studies have been undertaken to investigate the evolution over the last 10,000 years (the Holocene period) of the river catchments, the coastline including estuaries and the shelf sea. Specific objectives were to:

- determine how sediment fluxes between the land and the ocean have been influenced by changes in sea level, climate, geomorphology and land-use,
- determine the regional history of sediment fluxes, sources and sinks affecting the study area, with particular reference to the relative importance of fluvial, coastal and sea bed sediment sources,
- improve the accuracy of techniques to enable the dating of sediments up to 10,000 years old,
- model tidal circulation in the study area over the last 10,000 years.

This research programme has been supported by an ambitious coring campaign including offshore as well as onshore sites, backed up by sample curation and analysis. Other supporting work has included geological databasing for the Holocene sediments of the Fenland and Humber estuary and a programme of radiocarbon dating of selected samples. The results provide a long-term, geological perspective to many of the other investigations within LOIS which are concerned mostly with contemporary or recent processes. In particular they relate to sediment studies within the riverine and coastal programmes and also to studies of trace metal fluxes.

The research has provided the basis for a conceptual model which portrays the Holocene basin morphology for the Humber and the variations in the accumulated sediments. It also provides a space-time context for other LOIS projects. Investigations of the Holocene sediments of the Fens, the Lincolnshire and north Norfolk coasts and the lowlands of the Humber and Tees estuaries have enhanced our knowledge of the volumes of sediments involved, their spatial characters, their provenance and the conditions in which they formed. As well as using established radiocarbon sediment dating techniques, the programme has developed new methods based on sediment luminescence, including the calibration of these results with radiocarbon methods. Proxy dating methods have involved studies of palaeomagnetism in lake and saltmarsh sediments, and of industrial pollutants in river valley and marsh sediments.

The programme has included two projects that have examined changes in sea level during the Holocene, and the effects that these changes have had on the position of the coastline. The sea level change and palaeotidal studies

have involved the use of established models, revised to incorporate new site-specific information from the dating programme. Understanding the coastal evolution has been supported by the use of shallow seismic profiling techniques and by the palaeoenvironmental interpretation of onshore and offshore cores from the sampling campaign.

The Overview CD-ROM presents the following examples of data and illustrative outputs covering the theme of integration over time:

- locations, graphic logs and photographs of cores from the LOIS Holocene sediment sampling campaign (**Holocene sampling stations**),
- a visualisation of the base-of-Holocene surface for the Humber estuary (**Holocene sediment budgets**),
- an interpreted section across the Holocene sediments of the north Norfolk coast (**coastal evolution**),
- information relating to the radiocarbon dating programme (**Holocene sea level change**),
- graphic results of investigations of sediment contaminants in the Tees and Humber estuaries (**Holocene pollution**),
- sea level data and time-sequence maps showing coastline changes through the Holocene (**Holocene coastline movements**),
- geochemical data for major and minor elements for samples taken from boreholes (**Holocene geochemistry**),
- microfaunal data including ostracod and foraminifera species for samples taken from boreholes (**Holocene microfauna**),
- lithology information for selected boreholes (**Holocene lithology**),
- tidal velocity data for the North sea at 7500 years BP (**Holocene tidal cycle model**).