

Air-sea interface

Investigations of the air-sea interface undertaken within LOIS were aimed at understanding how nitrogen oxides and organic species are transported to, and transformed within, the marine atmosphere of the coastal zone. Chemical reactions convert the oxides of nitrogen to acid vapours, which are subsequently lost either to the sea surface or by deposition as aerosols. The main chemical transformations are initiated by two highly reactive oxidising agents: the hydroxyl radical (OH), which is present during the day but cannot be made at night; and the nitrate radical (NO₃), which is photolysed rapidly and so is present only at night. These processes are not just confined to anthropogenic gases; dimethyl sulphide (DMS), which is produced by phytoplankton, is oxidised very efficiently by both these radicals and is eventually converted to sulphate in aerosols.

The atmospheric programme was centred on the Weybourne Atmospheric Observatory on the north Norfolk coast, which provided an ideal location for observing chemical interactions in the atmosphere of the coastal zone. The measurement programme aimed to:

- provide data for undertaking the first full test of atmospheric chemistry model schemes by simultaneously measuring OH, NO₃, peroxy radicals, oxides of nitrogen, hydrocarbons and DMS,
- establish the fluxes and rates of transformation of these chemical species as they were transported through the coastal zone.

A charter ship, the *Guardian*, was stationed either upwind or downwind of Weybourne so that the two platforms observed the same air before and after it passed through the study area. A Jetstream aircraft was used to provide the three-dimensional component of the flux experiment. In addition, DMS concentrations were measured close to the sea surface during the *Challenger* cruises. These measurements provided maps of DMS concentration in the study area and, when they were combined with wind-speed information, flux maps were produced. A dispersion model was used to provide regional scale maps of sulphate (produced by sulphur dioxide oxidation), DMS and nitrogen chemistry; also to produce seasonally-averaged fluxes and depositional budgets of nitrogen and sulphur species throughout the study area. Such maps provide detailed spatial and temporal information of the fluxes of nitrogen and sulphur into coastal waters from the atmosphere at different times of the year.

Data illustrated on the Overview CD-ROM include:

- the locations of all **atmospheric sampling stations**,

- the cruise tracks when both sea and atmospheric sampling were undertaken (**atmospheric sampling stations**) and (**estuarine and coastal sampling stations**),
- a map of DMS fluxes to the atmosphere, based on seawater samples (**sea to air flux of Dimethyl Sulphide (DMS)**),
- model output maps of atmospheric nitrate and sulphate deposition (**atmospheric model output**).