ICOS INTEGRATED CARBON OBSERVATION SYSTEM

NATIONAL CONTRIBUTION **OF GERMANY**



Observation Networks Atmosphere

Ecosystems

Continuous measurements of greenhouse gas fluxes (H₂O, CO₂, CH₄, N₂O) between various ecosystems and the atmosphere are carried out by use of the eddy covariance technique. The flux stations are arranged in four regional clusters where different ecosystems are exposed to the same climatic conditions.





The atmospheric program comprises continuous monitoring the of atmospheric greenhouse gas concentrations (CO₂, CH₄ and N₂O) combined with flask samples, radiocarbon sampling and tracer measurements (CO and ²²²Rd) and their isotopic composition from a network of eight high towers.

Oceans

Continuous measurements of greenhouse gas concentrations and air-sea fluxes are carried out from three "Voluntary Observing Ship" lines in the North Atlantic Ocean and Baltic Sea as well as from two oceanic time-series at the most climate sensitive polar (Hausgarten) and tropical (Cape Verde) extremes of the North Atlantic.



Inverse modelling of greenhouse gas fluxes is based on the atmospheric concentration data, whereas bottom-up modelling uses eddy flux measurements at the ecosystem scale as well as chamber flux measurements on land and measurements of partial pressure in water and air at sea.

The map to the right shows modelled atmospheric CO_2 fluxes for a summer day around noon.

Modelling



The uncertainty of the average annual greenhouse gas fluxes between the land surface and the atmosphere can be reduced by increasing the number of tall towers and by optimising the towers' locations.

Top right: Uncertainty reduction for eight towers.

Bottom right: Uncertainty reduction for four towers.

Central Analytical Laboratories: FCL & CRL



The set-up of the ICOS Central Analytical Laboratories for production and delivery of calibration standards for the ICOS networks and dedicated high-precision analysis of grab samples for trace substances and isotopes in CO₂ is as follows:

A Flask & Calibration Laboratory (FCL) is situated at the Max-Planck-Institute for Biogeochemistry in Jena and a Central Radiocarbon Laboratory (CRL) at the Institut für Umweltphysik, Heidelberg University.



