The SFB 313, Global Environmental Change - The Northern North Atlantic

Priska Schäfer, and Members of the SFB 313, University of Kiel, 24118 Kiel, Germany

The SFB 313 "Global environmental change - the northern North Atlantic"

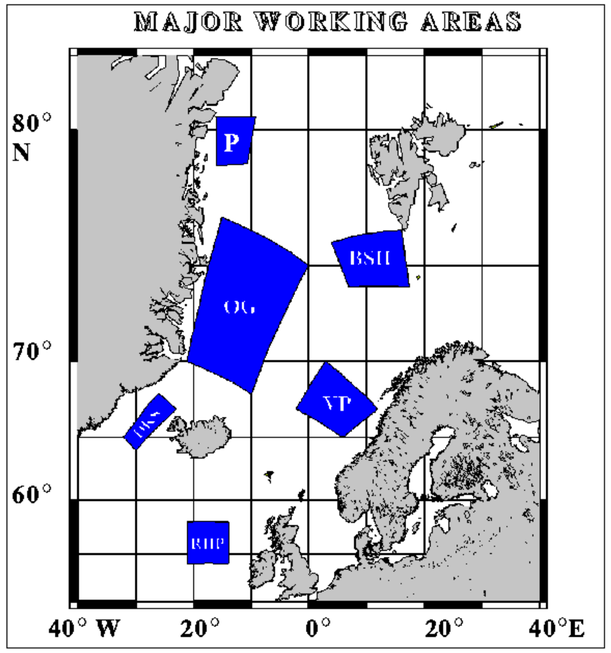
is a Special Research Project funded by the German Science Foundation (DFG)

The Norwegian-Greenland Sea is a geologically very young ocean basin and is particularly well suited to attempt reconstructions of past environments. Among a number of important aspects, this area is of central importance for the renewal of deep ocean waters and for the global ocean circulation system.

The scientific emphasis of the SFB 313 is placed on the variability of living conditions, their potential for change and on the environment in various spatial and temporal scales as documented in recent planktic and benthic associations and in marine deep sea sediments. To understand the environmental record archived in deep-sea sediments requires a deep sight into the complex processes generating the particles and controlling their fluxes to the seafloor.

To study the problems defined required a wide variety of specialists, which were organized in two large groupings of projects. One group devoted its efforts to processes controlling modern biological, sedimentological and chemical processes responsible for particle formation (primary production) and alteration of biogenic particles through the water column, bottom-near sedimentary processes causing lateral advection and formation of high accumulation centers along continental margins, as well as the flux of organic markers as a proxies for organic carbon. The other group had to establish undisturbed sediment records to deconvolute the stratigraphies and to describe and model past environments and environmental changes. One major goal of the SFB is an actualistic approach considered to improve our knowledge of pelagic processes and their documentation in the fossil record in the sediments. Although the stratigraphic record of sediments covered the past 300 ka, special emphesis was laid on the last interglacial-glacial-interglacial cycle, Terminations 1A and 1B, and the Holocene.

During the years 1985 to 1998 a large number of interdisciplinary expeditions were carried out in the Norwegian-Greenland Sea. The SFB created a large data base on a variety of biological and geochemical measurements in the water column and in the surface sediments, monitored the ocean particle flux with several long term moorings, and established a high resolution sedimentary record of the Late Quarternary of this area.

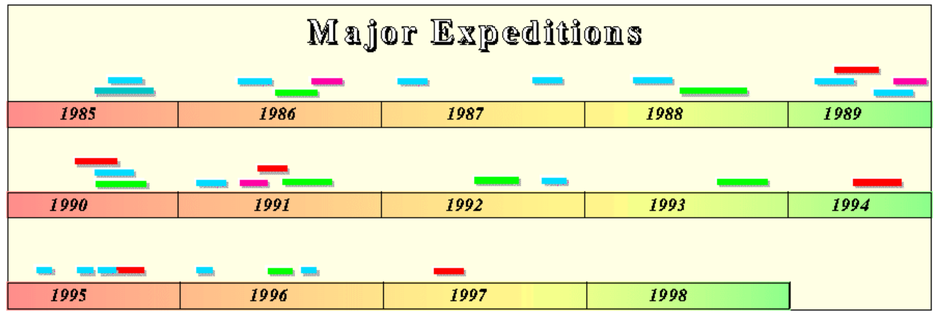


Characteristics of the SFB 313

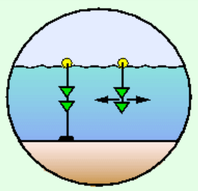
Duration: 1985 to 1998

Field areas and stratigraphic data base: Areas of special interdisciplinary interest have been the Vøring Plateau, the Barents Shelf slope, the East Greenland See including the Northeast-Water-Polynya, the Denmark Strait, and the Rockall Plateau. Longterm monitoring using sediment traps was applied from 1988 to 1998 in the Norwegian Sea and the Greenland Sea. About 70 long sediment cores for which a high resolution stratigraphy with stable oxygen isotpes and AMS-C14-datings has been established by the SFB 313 and other international working groups such as EPOCH and ENVIRONMENT (University of Bergen, CNRS.Laboratory, Gif sur Yvette a.o.) covers nearly all of the Nordic Seas. This data base guarantees a good stratigraphy of the sediments covering the last interglacial-glacial-interglacial cycle.

Expeditions: From 1985 to 1998, 38 expeditions with RVs Polarstern, Meteor, Poseidon, Valdivia as well as Norwegian, Russian, and Estonian research vessels have been undertaken. ODP-Leg 104 (Joides Resolution) at the Vøring Plateau escarpment and IMAGES-cores taken in the vicinity of the Barents Shelf slope have provided additional stratigraphic, sedimentological and paleoceanographic data from older time intervals than 300 ka.

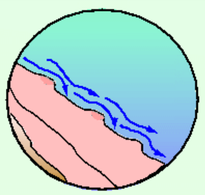


Production and Sediment Formation



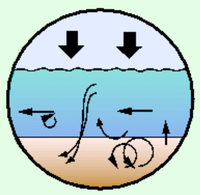
Pelagic Processes and Vertical Flux A1

Pelagic and ice-related sources and vertical flux control in the Nordic Seas; seasonal and interannual export variability and particle modification during sinking.



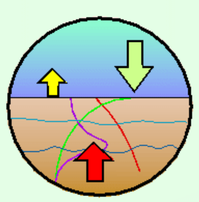
Processes, Budgets and Models of Sediment Transport A2

Topographic control of sediment transport and accumulation during Holocene and deglacial (Termination I) times in the Norwegian Sea; Mechanisms of sediment transport and modelling of turbidity plumes in the Norwegian-Greenland Seas.



Community Structure and Input of Organic material into the Benthic System A3

Bentho-pelagic coupling and carbon dynamics of sediment communities in the Nordic Seas; distribution patterns and community structure.



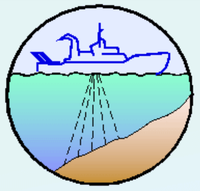
Flux and Diagenetic Modification of Indicators for Productivity and Environmental changes A4

Flux of chemical markers as proxies for carbon transport; Organic carbon and biogenic silica budget for surface sediments of the Nordic Seas; relation to primary production; transport and early diagenetic degradation of alkenones and other biological markers.

History of the Environment

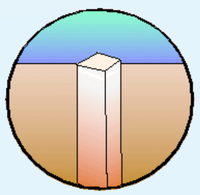
B1 Geophysical Signals in Sediments

Sediment structure of the continental margins based on small-scaled sedimentary, acoustic, and sediment-physical properties; dynamics of gas hydrates and their impact on acoustic properties of the sediments; consequences for margins stabilities and for methane and carbon releases.



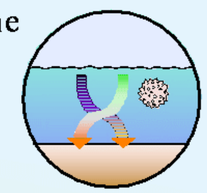
B2 Paleoceanography and Chronostratigraphy with isotopes: quantitative Reconstructions and test of models

Climatic change and paleoceanography over the last 80 ka (multi-decadel age control, ultra-high resolution of marine and ice-core time series of climatic change over $\delta^{18}O$-stages 3-1; millenial cycles; patterns of paleocirculation and fluxes, sea-ice distribution, iceberg drift, meltwater injections and sediment during key time slices.



B3 Paleontology of the Pelagial: environmental changes during the Late Quarternary

Plankton groups according to surface water masses; Export and alteration of plankton organisms in the water column; Development of plankton assemblages during the last 20.000 years and their response to paleoclimate.



B4 Numerical Models of Paleoclimate, paleoceanography, sedimentation, and the Carbon Cycle

Application of numerical models SCINNA, IMOC, SEDLOB, PATLOB, and OCCAM to reconstruct paleoclimate, paleoceanography, and sedimentation; modelling of the last glacial maximum (LGM), distinct meltwater events (MWE), the last glacial/interglacial transition, and of the carbon cycle.