

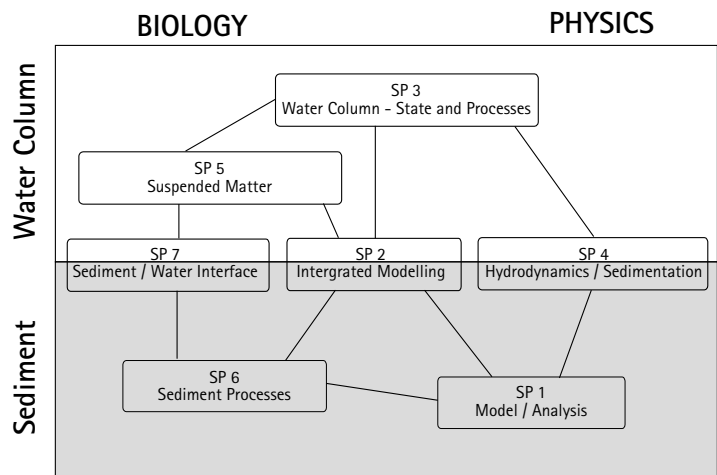
BioGeoChemistry of Tidal Flats

A DFG Research Group

The Research Group on *BioGeoChemistry of Tidal Flats* was installed by the Deutsche Forschungsgemeinschaft (DFG) in April 2001. It is devoted to perform fundamental research in the backbarrier area of the island of Spiekeroog. As outlined in the figure, a total of seven subprojects deals with water column and sedimentary processes as well as modelling. Besides the Institute of Chemistry and Biology of the Marine Environment (ICBM) at the University of Oldenburg - as the leading organization, the Max Planck Institute for Marine Microbiology in Bremen, the Senckenberg Institute and the Research Center Terramare, both in Wilhelmshaven, are involved in the project.

The investigations of the Research Group aim at a fundamental understanding of important biogeochemical processes in tidal flat systems. For this purpose, chemical and biologically mediated transformations on water-column-suspended particles, at the sediment-water interface and in the sediments themselves are investigated. Taking into account the hydrodynamic conditions, the influence of these different processes on material budgets will be determined. The data sets obtained encompass elemental distributions, especially those of manganese and iron as redox-sensitive elements, phospholipids, biomarkers such as hydrocarbons, fatty acids or steroids and inorganic nutrients. Biological data include bacterial numbers and activities both in the water column and in the sediment.

An important tool is the time series station in the Otzumer Balje, the tidal inlet between the islands of Langeoog and Spiekeroog. Here, CTD as well as ADCP systems are and will be installed to obtain high temporal resolution data. This system also allows for taking water samples at different water depths. As it can withstand both adverse wave and ice conditions and is equipped with a shelter, intense winter sampling should provide data that allow to elucidate the importance of wintery import and export processes. Regular monthly sampling both in the drainage area of the deep discharging from land into the Spiekeroog backbarrier area and the tidal channels and flats provides the necessary long-term data whereas high areal and temporal sampling rates emphasize the role of short-term processes.



From the data obtained a mathematical ecosystem model of the biogeochemical processes in the tidal flat sediments and at the sediment-water interface will be developed. On a higher level, a material budget will be established for a selected tidal flat area on the East Frisian North Sea coast (backbarrier tidal flat of Spiekeroog island). The results of experimental sediment transport studies will be described mathematically with a hydrodynamical model. In addition, a tight coupling of methods for analyzing nonlinear dynamic systems with ecological aspects will be used to reveal how spatial, temporal and/or spatio-temporal structures are formed due to nonlinear interactions of chemical and biological transformations, diffusion and advection. This technique will also be employed to determine whether exceeding a critical threshold leads to the spontaneous formation of new structures or dynamics. With this fundamental methodological contribution to the field of integrative modeling, the Research Group takes a significant step forward to the development of a comprehensive mathematical model of tidal flat systems which, beyond the initially selected study area, should also be applicable to other tidal flat areas and similarly complex systems. The work of the Research Group is based on the results of various past ecosystem research projects in the same coastal area, but in the analysis of the material budget and particularly in the integrative modeling it will, due to the innovative methodological concepts applied, break new scientific ground.

Further information: www.icbm.de/watt/eng_index.html

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