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NUMERICAL MODELING OF PARTICLE TRACING - A PROGNOSTIC TOOL IN MARINE GEOLOGY

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Sediment modeling of large ocean basins is a new tool in marine geology. SENNA (= SEdimentation - erosion, transport and deposition - in the Northern North Atlantic, NNA) and PATRINNA (= PArticle Tracing In the NNA) are prognostic numerical models developed for that purpose at the University of Kiel. Especially the tracing of particles in deep ocean basins over long distances and time intervals can be used for the prediction of movement of water masses and sediment transport. Both dynamical models are driven by the thermohaline oceanic circulation and therefore coupled to an Ocean General Circulation Model.

SENNA and PATRINNA combine two coupled models: the 3–D models calculate the sediment transport and the separate particle traces in the water column. In SENNA the 1 centimeter thick 2–D bottom layer considers the erosion, transport and deposition of sediments; in PATRINNA single particle–drifts parallel to the sea floor. Both models are based on the same coordinate system (95 grid points in both horizontal directions; 50 km grid spacing) and topography (17 levels).

Here, we present the results of numerical experiments for the modern state and for the Last Glacial Maximum of the whole NNA. The simulated sedimentation patterns and particle paths fit very well the observed sediment distributions, e. g. the large sediment–drifts south of the Greenland-Scotland Ridge.

The strength of our new models is the predictability of tracing transport paths for various kinds like sediments, water masses, pollutants, and organic material for variable scenarios, natural or artificial. This application is shown for selected experiments.