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Modeling of sediment and water volumes transport at different time slices: A comparison between the North Atlantic and the global conveyor.

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An Ocean General Circulation Model (OGCM) and two three–dimensional (3–D) large–scale models, i.e. an ocean sediment transport and a semi–lagrangian trajectory–tracing model, are used for a better understanding of the ocean circulation and complex interactions in the ocean–sediment system since the last glacial maximum (LGM). The 3–D sedimentation model SEDLOB (SEDimentation in Large Ocean Basins) and the trajectory–tracing model PATLOB (Particle Tracing in Large Ocean Basins) are initialized and driven by the thermohaline circulation (temperature, salinity, velocity and convection depths) which is generated from the OGCM. SEDLOB simulates the sedimentation rates depending on the corresponding circulation patterns and pelagic sediment dynamics. PATLOB traces transport pathways of material particles, e.g., water parcels, sediment components, pollutants, and natural or artificial organic material.

Our objective is to quantify the sedimentation rates and pelagic sediment dynamics at three time slices: the Holocene/Modern (HM), the Meltwater Event at 13,500 ^{14}C yrs BP (MWE), and the LGM (18,000 ^{14}C yrs BP). The paleocirculation patterns differed from the HM significantly, though the locations of the sedimentation drifts did practically not change in the North Atlantic. However, the sedimentation rates in these drifts were different during both the LGM and MWE, as compared to each other and to the HM.

PATLOB is used to interpret the ventilation of the deep ocean and to analyze changes of the routes of the major ocean currents and/or transports of settling particles. A computer animation program has been developed to utilize this advantage of the semi-Lagrangian technique, providing us with a very useful tool to address both sedimentation and deep ocean ventilation problems. Especially in our global experiments these simulations show complete different pathways of material particles although the horizontal velocity maps look partly similar.

The different pathways of particles and the sediment deposition will be shown in several video presentations.