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# NORTH ATLANTIC PALEOCIRCULATION AND SEDIMENT TRANSPORT: A STUDY USING A THREEFOLD MODELING APPROACH

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Different Ocean General Circulation Model re employed to simulate the North Atlantic circulation existing at the Holocene/Modern (HM), at the Last Glacial Maximum (LGM), 18,000 yrs $^{14}$C BP and at the Meltwater Event near 13,500 yrs $^{14}$C BP (MWE). The computer experiments to calculate the past ocean currents are based on paleoreconstructions of sea surface temperature and salinity compiled at GPI Kiel, and on the wind stress from the T42 atmospheric model provided by MPI–Hamburg.

The numerical experiments depict pronounced differences in the upper ocean circulation for all three time slices. The North Atlantic Deep Water (NADW) production dropped by 30% from its today‘s intensity at the LGM. During the MWE the NADW production has practically stopped. Consequently, the deep ocean circulation and near–bottom currents differed noticeably at the LGM and drastically at the MWE.

Two models were used to improve our comprehension of the deep water circulation regimes, and their impacts over sedimentation linked to the three different paleoclimates of the North Atlantic. A three–dimensional (3–D) sediment transport model and a semi–Lagrangian trajectory–tracing model were employed as add–ins to quantify sedimentation rates and pelagic sediment dynamics and to visualize true 3–D water parcel motion. The trajectory–tracing model is an especially useful tool to interpret ventilation of the ocean deep and to analyse changes of the routes of the major ocean currents.

The comparison of the water volume transports relevant to three different circulation regimes indicates fundamentally different ventilation controls over the North Atlantic. In contrast to the HM ventilation that occurs in the Nordic Seas, in the northern North Atlantic south–east of Greenland, and in Labrador Sea, the site of the glacial deep ventilating convection is shifted to the central–northern North Atlantic, with only shallow convection still operating in the Greenland–Iceland–Norwegian Seas. During the MWE the deep North Atlantic was not ventilated. Trajectory–tracing indicates that the glacial subtropical thermocline was far better ventilated than its modern analogue. The results of the semi–Lagrangian calculations agree well with proxy data analysis and with interpretations of sediment records in the northern North Atlantic. The method can be used as an additional tool to supplement geochemical tracer analysis, or as an alternative instrument to constrain interpretation of the ocean paleocirculation modeling.