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TI: Inter-Basin Water Exchange and Sedimentation During Late Quaternary
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AB: The global water transports facilitating the inter-basin exchange are crucial for understanding the glacial and warm climates. Yet the simulations of the ocean paleocirculation are difficult to validate because of the general lack of hydrological data. Inasmuch as the history of the ocean circulation is under debate, there is a call for using geological data to validate the diverse modeling results. During the late Quaternary, the global thermohaline conveyor, also known as the salinity conveyor belt, underwent major structural changes linked to the glacial-to-interglacial climate transition. Sediment transport and sedimentation rates depend on the ocean currents and may reflect the change of the circulation pattern. We present two paleoclimate simulations illustrating the glacial-to-interglacial change of the conveyor as reflected in water parcel motion and sediment transport based on the computed velocity fields.
The global conveyor is modeled numerically using available sea surface data for the Last Glacial Maximum and a subsequent meltwater event near 13.5 ka. The results of these two runs are compared against a control run performed using the present-day sea surface climatology.
Traditional calculations of thermohaline circulation are supplemented by off-line Lagrangian trajectories and by simulations of sediment transport using a 3-D sedimentation model. Inter-basin water exchanges are quantified for the glacial and meltwater events and compared to the control run. The conveyor dynamics and inter-basin water exchange show dramatic alterations due to the localized meltwater event in the North Atlantic. These changes are easily visualized by Lagrangian technique and are also traceable by sediment deposition rates in the different basins. The impact of the meltwater event is greatest in the northern North Atlantic. However, sedimentation patterns also reveal a reversal of the conveyor in the Atlantic-Indian sector of the World Ocean. These simulations indicate that the sediment transport in the South Atlantic and Indian Ocean during late Quaternary may have been substantially affected by glacial-to-interglacial circulation changes. Hence, the marine sedimentary record may become instrumental for validating paleocirculation modes generated by the ocean circulation models.
DE: 4255 Numerical modeling
DE: 4267 Paleoceanography
DE: 4532 General circulation
DE: 4558 Sediment transport
DE: 3022 Marine sediments--processes and transport
SC: U
MN: 1998 Fall Meeting