Different sediment transport and particle motion during glacial–to–interglacial cycles of the ocean paleocirculation

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The Last Glacial Maximum (LGM) and subsequent meltwater events give examples of vigorous changes of the deep–sea ocean circulation that have been reasonably well modeled using stand–alone ocean models. However, there are still questions whether these simulations can be verified by comparison to geological record, or by some other means to increase their credibility. The major unknown is whether millennial–scale changes of the circulation can be clearly seen in ocean sediment, and whether the water mass motion can be effectively traced in large–scale ocean models. We present trajectories and sedimentation patterns obtained using simulations of the LGM and meltwater ocean currents in the MOM–2 ocean global circulation model. Additional passive tracers and lagrangian trajectories help to identify water paths, whereas comparison of modeled and observed sedimentation patterns reveal the model performance in tracing the circulation changes. Different mixing schemes are used to address model sensitivity to changes of convection regime — key process in the glacial to interglacial variability of the deep–sea currents. We show that it is possible to compare simulated and observed inorganic sedimentation patterns, at least in the regions of sediment drifts. Different sea–surface sources of eolian sediment were used to address the problem of usability of the eolian sediment as an additional tracer. It is shown that the signature of the deep–ocean currents is recognizable in the net inorganic sediment accumulation patterns and is not completely overwhelmed by the sea-surface signal.

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