Deepwater circulation in the East China Sea margin since the last deglaciation from Nd isotope

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Revolutionary New Method

Major elements, REEs and Sr, Nd isotopic compositions of Fe–Mn oxyhydroxide fractions have analysed leached from the sediments of the middle and southern Okinawa Trough with 1 M hydroxylamine hydrochloride. The aim is to test the potential of the Fe-Mn leacates for paleoceanographic reconstructions in the marginal sea.

Discussion of Results

Leachates have incorporated detrital Sr with $^{87}Sr/^{86}Sr$ isotopic signature distinct from that of modern seawater (0.7092) which indicates detrital contamination may occur during the leaching procedure. The significant enrichments of middle REE with weak positive Ce anomaly in the Fe-Mn leachates highlight the presence of Fe–Mn oxides. This provides reassuring evidence that the detrital contamination has only a limited impact on the overall REE concentrations in the Fe–Mn leachates which is consistent with the presence of Ti, Al. The separation of Fe–Mn phases has been effective regarding to the REE and, in particular, Nd, which isotopic composition is a direct proxy for ambient seawater.

Inferred Nd isotope compositions of water mass around, identical lower value of ε_{Nd} and weak positive Ce anomalies for Core ODP1202B and DGKS9064 during the last deglacial suggest enhanced deepwater ventilation with the advection of the North Pacific Intermediate water (NPIW) and/or South China Sea Intermediate water (SCIW) into the trough responding to a relative oxic condition. The large shift ε_{Nd} and δCe during the early Holocene (11–9.5 ka) marks a major change in the deepwater circulation regime to weak ventilation brought about mainly by invasion of the Kuroshio Current into the trough. This study can provide new insights into the linkage between marine authigenic Fe-Mn oxides and deepwater ventilation in the continental margin where terrigenous input dominates.