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Nd isotopic stratigraphy reveals bimodal glacial-interglacial Himalayan erosion regime

L. Meynadier, A.T. Gourlan, **C.J. Allegre**

Equipe de Geochimie-Cosmochimie, Institut de Physique du Globe, Paris
[meynadier@ipgp.jussieu.fr]

A high resolution record of the 143Nd/144Nd ratio of Northern Indian Ocean seawater and associated detrital sediments has been obtained for the past 4 Ma using a new method of differential dissolution on marine sediments. We studied ODP Sites 758 and 757 both located on the Ninetyeast Ridge. At Site 758, the ϵNd and δ18O curves fluctuate in conjunction during the glacial-interglacial periods. The largest variation occurred during the last 20 kyrs where ϵNd varies from -7.5 at Last Glacial Maximum to -10.5 during the Holocene, whereas the amplitude of the variation of the seawater signal is less than 1 ϵunit 3 Ma ago. The correlation between maxima and minima of δ18O and ϵNd is excellent (r=0.95). However, a detailed comparison of the two signals show that ϵNd and δ18O vary simultaneously during warming while ϵNd is delayed with respect to δ18O during cooling.

The southern ODP Site 757 shows little variations in Nd isotopic ratio. We thus interpret the ϵNd fluctuations at Site 758 as being linked to the erosion regime in the Himalayas-Tibet rather than to variations in the intensity of the deep ocean conveyor belt which flows from the South to this area. Such variations were probably governed by storage of more ice in the Himalaya-Tibet highlands during glacial periods and by ice melting and the enhancement of monsoon rainfall during interglacials. A simple quantitative model assuming that seawater Nd is a mixture of Nd that was chemically eroded in the Himalaya-Tibet with Nd coming from island arcs indicates that chemical erosion was 2 to 4 times more intense during interglacial than during glacial periods.

Comparison with Lead isotopes data obtained on the same samples will be made.