Nd-Sr-Pb evidence of glacial–interglacial variations in clay provenance and transport in the North Atlantic Ocean

V. Bout-Roumazeilles
G. Davies

Dept. of Earth Sciences, Vrije Universiteit Amsterdam, 1081 HV Amsterdam, The Netherlands

L. Labeyrie

Centre des Faibles Radioactivités, Laboratoire mixte CNRS-CEA, 91198 Gif-sur-Yvette, France

The purpose of this study is to characterize palaeoceanographic variations induced by climate changes on the glacial-interglacial time scale. The climatic control of terrigenous clay mineral sedimentation depends on latitudinal and longitudinal distribution of the sediments investigated (Bout-Roumazeilles *et al.*, 1997). The climatic variations affect the intensity of both physical and chemical weathering on the continent and, the transport of clay minerals by wind and marine currents.

Clay particules, less than 2 microns, from a series of ODP cores and piston cores from various geographical settings in the North Atlantic and Arctic Oceans, will be used as palaeoceanographic proxies. Nd-Sr-Pb isotope composition of the clay minerals will provide informations as to changing detrital fluxes, source provenances, and deep-water transportation patterns. Sr and Nd isotopic data have been successfully used on the bulk lithic fraction of sediments for hydrological and sedimentological reconstruction of the North Atlantic ocean since 150 Ky (Revel *et al.*, 1995). Our work is focused on the transition from glacial stage 6 to interglacial stage 5, which is clearly characterized in all cores studied by drastic modifications of the clay mineral fraction composition.

Four sites are located in the Western Atlantic basin: core SU90-38 is located near Rockall Plateau;

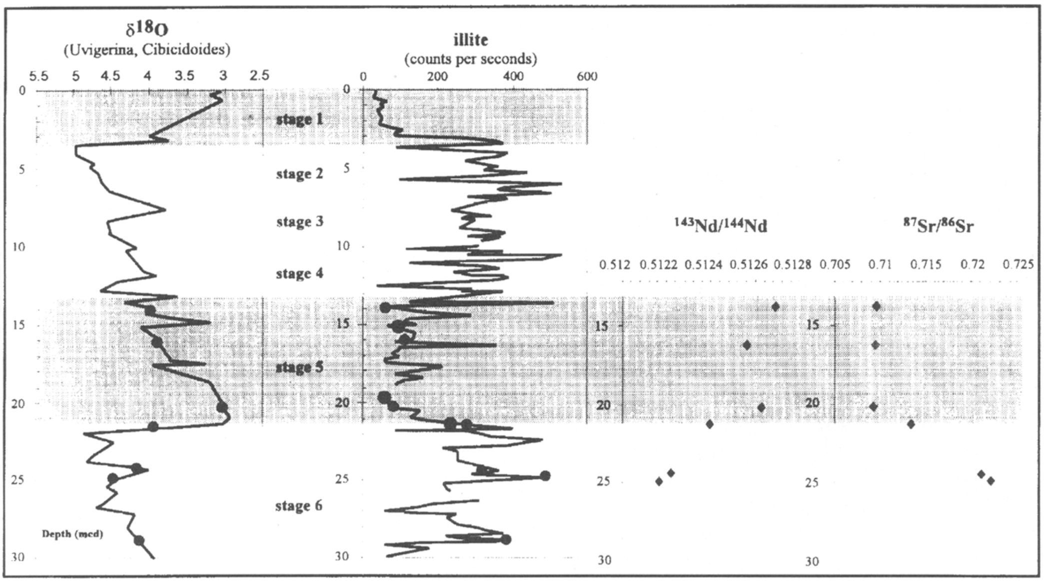

FIG. 1. $\delta^{18}O$ of benthic foraminifera, illite content (measured by XRD), Nd and Sr isotopes ratios of clay particles plotted against depth for core from ODP leg 162, south Iceland. Note that illite content and $\delta^{18}O$ are anticorrelated indicating strong climatic control to clay deposition. Changing clay deposition is also correlated with distinct clay provenances, i.e. changes in Pb-Sr-Nd isotope ratios.

sites 980/981 are located on the Feni Ridge, core SU90-33 is situated on the southern margin of Iceland; site 984 is located near the Reykjanes ridge. Five sites were sampled in the eastern Atlantic basin: ODP site 902, on the slope of the New Jersey passive margin, core SU90-08 is situated near the Azores; cores SU90-11 and SU90-12 are situated on seamounts in the north American basin; core SU90-16 is located on the southern margin of Greenland. Two cores are located in the Arctic Ocean: site 986 on the continental rise of Spitzberg, and site 987 in the continental slope of east Greenland.

Cores are mainly composed of illite, smectite, chlorite, kaolinite and irregular illite-vermiculite mixed-layers minerals. All cores are characterized by strong short-time modifications of the clay-fraction composition clearly linked to glacial–interglacial periods. For example, at site 984 (see Fig. 1), the respective abundance of illite *vs* smectite followed climatic cycles. High illite and low smectite content characterizes glacial periods whereas high smectite and low illite content marks interglacial episodes. Consideration of the site of the core and its mineralogical and geochemical compositions, we conclude that smectite is a product of chemical alteration of Icelandic basalts, whereas illite has a provenance from the European continent.

Preliminary isotope data confirm that modifications of the main detrital source area occur at the stage 6-stage 5 transition (see Fig. 1) in the northeastern Atlantic basin. The old continental European source is gradually replaced by a young basaltic one. This implies that the main oceanic and atmospheric transport patterns vary gradually from glacial to interglacial conditions. We will present isotopic and mineralogical data from sites throughout north Atlantic and Arctic Ocean, in order to compare glacial-interglacial oceanographic changes in basins characterized by different climatic, oceanographic and sedimentological features.

References

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