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Lead isotope evolution of North Atlantic Deep and Intermediate Waters in the western N Atlantic since the Last Glacial Maximum

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Lead isotopes are valuable tracers of ocean circulation and continental weathering. Records of the dissolved Pb isotope composition of seawater over millions of years have been recovered from ferromanganese crusts. Using laser ablation techniques the time resolution of these data can be increased to ca. 5-10 kyr, which is, however, still insufficient to fully resolve short-term climatic excursions such as the Younger Dryas or Heinrich events. We have extracted the Pb fraction of authigenic Fe-Mn oxyhydroxide coatings from pelagic sediments along the Blake Ridge, western North Atlantic (ca. 30˚N) from one shallow (1790 m) and two deep core sites (3410 m and 4250 m). Our records allow a first insight into sub-millennial scale changes of the Pb isotope composition of the major water masses in the western North Atlantic. All three sediment core records of this study show that the seawater Pb isotope signal changed significantly towards more radiogenic compositions between the Last Glacial Maximum (LGM) and the early Holocene. The most prominent changes occurred at the two deep locations between the deglaciation and the Holocene. At 4250 m (3410 m) $^{206}Pb/^{204}Pb$ changed from 18.93 (18.94) during the LGM to 19.37 (19.39) in the early Holocene and 19.21 (19.22) at present. The same trendswith smaller amplitude are observed for $^{208}Pb/^{204}Pb$ and $^{207}Pb/^{204}Pb$. These patterns demonstrate the coupled effect of changing water mass signals and the superimposed intensification of continental chemical weathering, which is reflected in a more incongruent release of radiogenic Pb at the transition to the Holocene. Neodymium isotope analyses carried

out on the same coating fractions indicate that the interglacial mode North Atlantic Deep Water (NADW) was not present at the deeper Blake Ridge before the beginning of the Holocene. Hence the lack of significant changes in the Pb isotope composition of seawater before the Holocene at the deeper sites, followed by a dramatic change over a short period of time at the beginning of the Holocene indicates that a relatively stagnant water mass was then replaced by the vigorously flowing Deep Western Boundary Current (DWBC). The release of highly radiogenic Pb derived from old continental rocks to Labrador Seawater, one of the major components of the DWBC, most likely intensified at the same time and contributed to the observed changes.