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Tracking variations in North Atlantic Deep Water Flow on Eirik Drift

L. Neitzke, J. Wright, and S. Henderson

Rutgers University, Department of Earth and Planetary Sciences, New Jersey, USA (lneitzke@eden.rutgers.edu)

North Atlantic Deep Water (NADW) circulation has been described as bi-modal with shallow flow associated with the last glacial maximum (LGM) and a deeper current associated with the Holocene. We have generated high-resolution foraminiferal stable isotope and sedimentological (sedimentation rates and coarse fraction) records, as well as AMS ^{14}C age chronologies from two cores collected on the northeastern crest and southwestern toe of Eirik Drift (Cores 15JPC and 21GGC, respectively). Our records show that the shallow mode of NADW circulation persisted through the deglacial and into the early Holocene. Beginning around 9 ka (calendar age), the core of NADW began to descend, reaching its present position by 8 ka. This is consistent with Fagel et al. (2002) who argued that Denmark Strait overflow, which is the densest contributor to NADW, began around 8.5 ka in the North Atlantic.

Higher frequency changes in the benthic foraminiferal δ^{13}C and sedimentation rates during the late glacial through deglacial record interruptions in NADW flow. These proxies suggest that during the LGM, the axis of NADW was proximal to our shallow core location (2230 m, Core 15JPC). A marked decrease in sedimentation rates ($<$ 15 cm/kyr) and benthic δ^{13}C values ($\sim$ 1 ‰) in Core 15JPC occurred from 18 to 16 ka, and is interpreted as a further shoaling of NADW and influx of AABW. The start of this decrease predates the H1 event but the carbon isotope decrease continued through the H1 event, reaching minimum values at 16.3 ka. Following the H1 event, sedimentation rates increased sharply to rates $>$ 30 cm/kyr, indicating a resumption of NADW flow and that the current was actively supplying sediments with minimal winnowing. At 14 ka, benthic foraminiferal δ^{13}C values increased to approximately

1 ‰, associated with the Bolling-Allerod warming, and fluctuated about a mean of 1 ‰ until the beginning of the Younger Dryas at 12.5ka. During the Younger Dryas, benthic carbon isotope values in Core 15JPC decreased by 0.5 ‰, signaling a minor reduction in NADW flux. Following the Younger Dryas event benthic δ^{13}C values in Core 15JPC fluctuate between 0.5 and 1.5 ‰, indicating a high flux of NADW. This flux persisted into the early Holocene until approximately 9 ka when sedimentation rates in Core 15JPC decreased ($<$ 20 cm/kyr) and coarse fraction values increased ($>$ 20 %), suggesting that the deep current was actively winnowing the sediments at this site. At this time (10 to 8 ka), sedimentation rates also dramatically decrease from approximately 140 cm/kyr to about 40 cm/kyr at the deeper site (3450 m, Core 21GGC). This is interpreted as the transition between the shallow and deep modes of NADW flow when sediments began to accumulate on the southern and western most portions of the drift.