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Onset of Heinrich events in the eastern North Atlantic at the end of the Middle Pleistocene Transition (∼650 ka)?

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Heinrich events have been well documented for the last glaciation but little is known about their occurrence in older glacial periods of the Pleistocene. During IODP Expedition 303, Site U1308 was drilled at the same location as DSDP Site 609, which yielded an important reference section for Heinrich layers in the North Atlantic and their correlation to Greenland ice cores but had uncertain continuity back through time. Here we report scanning XRF data from Site U1308 that is used to develop proxy records of ice-rafted detritus (IRD) for the last ∼1.4 Ma. Ca/Sr is used as an indicator of IRD layers that are depleted in biogenic carbonate and rich in detrital carbonate (i.e., Heinrich events), whereas Si/Sr reflects layers that are poor in biogenic carbonate and relatively rich in detrital silicate minerals (e.g., quartz). A pronounced change occurred in the composition and frequency of IRD at ∼650 ka during Marine Isotope Stage (MIS) 16, coinciding with the end of the Middle Pleistocene Transition (MPT). At this time, Heinrich events suddenly appeared in the sedimentary record of Site U1308 and the dominant period of the Si/Sr proxy shifted from 41-kyrs prior to 650 ka to 100-kyrs afterwards. The onset of Heinrich events during MIS 16 either represents the initiation of catastrophic surging of the Laurentide Ice Sheet (LIS) off Hudson Straits or the first time icebergs produced by this process survived the transport to Site U1308. North Atlantic sea surface temperature (SST) records indicate a cooling trend during glacial periods across the MPT, but the greatest cooling preceded the first Heinrich event by ∼250 kyrs. We speculate that ice volume (thickness) and

duration surpassed a critical threshold during MIS 16 and activated the dynamical processes responsible for LIS instability in the region of Hudson Straits. Our results support previous findings implicating changes in the volume and dynamics of the LIS as an important process for the MPT. We also observe a tight coupling between IRD proxies and benthic δ^{13}C variation at Site U1308 throughout the Pleistocene, supporting a strong link between iceberg discharge and weakening of Atlantic Meridional Overturning Circulation (AMOC).