Icebergs in the Subtropical North Atlantic: The Impact of Freshwater Influx on Climate and Ocean Circulation Early in the Last Glaciation

Petra Zúñiga[1] and Jerry F. McManus[2]

[1]Amherst College, [2]Lamont-Doherty Earth Observatory of Columbia University

The North Atlantic Ocean experienced abrupt climate changes throughout the last glacial period, (115 – 11.5 ka). These climate shifts have been attributed to changes in Atlantic meridional overturning circulation (AMOC), which distributes salt, heat and gasses throughout the world's oceans, and thus has played an important role in regulating Earth's climate. Previous modeling has shown that massive influxes of freshwater in the North Atlantic may have significantly slowed the rate of oceanic overturn. One potential source of freshwater across the Atlantic is the melting of icebergs that were released throughout the region en masse during the Heinrich Events that occurred every 7-10 ky during the last glacial period. Previous studies used the presence of ice rafted debris (IRD) in the North Atlantic to make inferences about the scope and reach of icebergs throughout the last hundred ky. In this study, we examined sediment core KNR 191- 19 CDH (33.6°N; 57.5°W, 4.5km) from Bermuda Rise, in the subtropical North Atlantic, for evidence of icebergs during Heinrich events 5a and 6 (~55-65ka). Due to the influence of North Atlantic Deep Water and rapid sediment accumulation, this area has been extensively studied to explore the relationship between ocean circulation and climate change on short time scales. Although a previous study suggested evidence for occasional IRD deposition during the last glaciation (1), there have been no subsequent published studies dedicated to reconstructing iceberg deposition at this subtropical location. In this study, we found spikes in IRD at multiple intervals throughout the core, including a value of ~3 grains/g of bulk sediment - greater than any previously documented IRD on Bermuda Rise. By comparing our IRD values with previously collected paleoclimate data (d18O, SST, %CaCO3, Pa/Th, d13C), we seek to elucidate information about the timing of climate and ocean circulation changes during the last glacial period, and confirm the influence of freshwater influx on these systems. These findings of natural variability in the past have implications today, as ongoing climate change and ocean warming increase the potential of future freshwater influxes at high latitudes in the North Atlantic Ocean.

1. Keigwin, L. D. & Boyle, E. A., (1999) Paleoceanography, v. 14, no. 2, p. 164-170.