LATE QUATERNARY CHANGE ON THE SOUTHERN MORRIS JESUP RISE (ARCTIC OCEAN)

Alejandro Tiburcio

Master Program for Polar and Marine Sciences POMOR / 050406 Ecology and Environmental Management

Supervisors:
Prof. Dr. Robert F. Spielhagen, GEOMAR Helmholtz Zentrum für Ozeanforschung
Prof. Dr. Alexey Krylov, VNIIOkeangeologia, St Petersburg State University, Institute of Earth Sciences

The Arctic is the region most affected by current climate change, and its continued warming could take the Earth system on a “hothouse” path. A critical tipping element for this could be the loss of the Greenland Ice Sheet, which would trigger a cascade of tipping points that would accelerate warming and alter climate patterns. Therefore, it becomes important to study and analyse climatic changes in the past to better understand the processes of ongoing climate change. The North Greenland area in particular has only few data available, therefore, we can learn a lot from studying climatic change on glacial/interglacial timescales in this unexplored region. In order to derive data on past changes in marine and terrestrial environments, we analyzed a core taken from the Morris Jesup Rise off the coast of N. Greenland. We used the negative correlation between planktic foraminifera abundances and ice-rafted detritus (IRD) content (wt%), as these two proxies can correlate to sea ice coverage and extent of glaciations on land.

Our results reveal variable paleoenvironmental conditions for the last 200 ka like times of open waters, Atlantic Water inflows, the reconstruction of glaciation in IRD source areas, and sedimentation rates. For example, the Saalian glaciation during MIS 6 and the Last Glacial Maximum during MIS 2 show quite different characteristics. MIS 6 has a strong input of coarse-grained IRD, indicating strong iceberg drifting. On the other hand, MIS 2 is characterized by a low IRD input and very low sedimentation rates that point to a hiatus in sedimentation. Carbonate IRD %, however, shows that during MIS 4-2 carbonate rock source areas of N. Canada/N. Greenland were covered by an ice sheet that produced icebergs despite the low sedimentation rates. By contrast, during MIS 6, the carbonate IRD % remained much lower despite a strong IRD input, suggesting that the source areas of carbonate rocks may not have been as strongly glaciated as in the last glacial stage.

The interglacials MIS 5e and MIS 1 possibly had similar conditions with similar sea levels, Siberian shelves flooded, seasonally open waters, and sea ice as the main transport agent of sediments. However, during MIS 5e carbonate IRD % is higher than during MIS 1. This indicates that during the Eemian, there was a presence of glaciers or ice sheets over the carbonate source areas of N. Canada/N. Greenland. In contrast, MIS 1 has a very small input of carbonate IRD %, indicating that iceberg drafting from N. Canada/N. Greenland decreased significantly.

Atlantic Water inflows and seasonally open waters, indicated by high planktic foraminifera fluxes, during a period of low insolation could have provided the atmospheric moisture from evaporation that in turn may have fostered the increase of ice sheets like during late MIS 7 and early MIS 4. The mid to late MIS 3, and MIS 2 sediments are characterized by a decreasing IRD content and low sedimentation rates, suggesting a closed sea ice cover during this period.