Geophysical Research Abstracts
Vol. 13, EGU2011-7645, 2011
EGU General Assembly 2011

Centennial scale variability in Scotia Sea surface and bottom water properties during the Late Holocene

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The Southern Ocean has been one of the most rapidly warming regions of the world. Yet sources of these trends and the relative roles of anthropogenic and natural influences, as well as their potential impacts on ocean circulation remain debated—due, in part, to the brevity and scarcity of appropriate instrumental records. Records characterizing long-term natural climate variability are, therefore, necessary to contextualize recent trends and to understand their potential impacts on the Southern Ocean and its circulation.

Here we use a radiocarbon dated, 25 cm long sediment core (Multicore GS08-151-02MC, 53˚ 31.81'S, 44˚ 42.14' W, 2750 m) to infer near surface polar variance over the last 3500 years. We use an oxygen isotope record of planktonic foraminifera (*N. Pachyderma* s.) to reconstruct surface ocean physical properties and infer changes in the large-scale oceanic and atmospheric systems that influence them. Our initial *N. Pachyderma* (s.) δ^{18}O results indicate a cooling trend in polar near surface waters over the last several millennia overlain by frequent variability of up to 1˚C (or 0.71 PSU). This centennial scale variability is of the same magnitude as recent warming but occurred over much longer timescales. To further elucidate the relationship between natural climate variability and deep ocean circulation, we compare near surface and bottom water property records within our core—allowing us to unequivocally resolve the magnitude and timing of deep ocean changes relative to surface property variability. Our initial *Uvigerina* δ^{18}O results show that bottom water property variability is of similar magnitude to that in the near surface record indicating that there has been significant natural variability in Southern Ocean deep water on centennial timescales. The existence of significant centennial scale variability in both surface and deep Southern Ocean physical properties supports the hypothesis that ocean property anomalies in this region play a critical role in the genesis of centennial scale variability in climate and meridional overturning circulation.