Geophysical Research Abstracts
Vol. 14, EGU2012-5401, 2012
EGU General Assembly 2012

Climate changes and calcium carbonate dissolution of planktic foraminifera assemblages over the last 30,000 years in the Fram Strait

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The ocean plays an important role in climate change. The levels of greenhouse gases and the CO_2 uptake by the ocean have increased in recent years and prediction of future changes in climate and in ocean acidification is of increasing importance. Knowledge of mechanisms that control the climate-ocean system is necessary for reliable predictions. In marine sedimentary archives fossil planktic foraminifera is one of the most common and important proxies used in reconstructions of paleoenvironments and climate. However, their shells are vulnerable to dissolution. Selective dissolution can alter the distribution patterns of the planktic foraminiferal species, which have implications for the interpretation of past environmental changes.
The Fram Strait is one of the main oceanographic connections between the Arctic and the rest of the World Ocean. The eastern Fram Strait is occupied by the warm and saline Atlantic water transported by the West Spitsbergen Current. In the western Fram Strait, cold and fresher Polar water and sea-ice are carried southwards by the East Greenland Current. The two different water masses generate two oceanic fronts. The areas along the Polar and the Arctic front are characterized by high primary production and abundances of planktic foraminifera. Three high time resolution sediment cores located below the Atlantic water masses reveal details of oceanographic and carbonate preservation changes in the Fram Strait from the late Weichselian to the Present. Composite dissolution indices were applied to assess the preservation state of the planktic foraminiferal shells. The extent of dissolution was quantified using the mean shell weight of planktic foraminifera specimens, % of fragmentation, and $CaCO_3$ content. In addition, observational indices and changes in species composition were used.
The results indicate that fossil planktic foraminifera in the Fram Strait are affected by selective dissolution. Very poor preservation occurs within highly productive areas along the Arctic and Polar fronts. Moreover, the reliability of SST reconstructions based on planktic foraminiferal assemblages in this area, appears to be considerably reduced.