Geophysical Research Abstracts
Vol. 14, EGU2012-11407, 2012
EGU General Assembly 2012

Coccolithophore community composition and calcification rates in the Norwegian and Greenland seas as a function of carbonate chemistry and other environmental parameters.

S. Loucaides (1), A Poulton (1), R Bellerby (2), and T Tyrrell (1)
(1) National Oceanography Centre, Southampton, UK, (2) University of Bergen, Norway

The industrial revolution and the subsequent increase in fossil fuel combustion has led to a dramatic increase of carbon dioxide (CO_2) released into the atmosphere. About a quarter of the anthropogenic CO_2 released during the last few decades has been taken up by the ocean leading to a decrease in pH and $CaCO_3$ saturation states (Ω). $CaCO_3$ saturation states are lower in high latitude waters mainly due to the fact that cold water can hold more CO_2 and that dissolved CO_2 in most of the surface ocean is at near-equilibrium with the atmosphere. Current projections suggest that increasing uptake of CO_2, combined with higher freshwater inputs from ice melt will lead to the entire water column of the arctic to become undersaturated with respect to aragonite by the end of this century. Although the effect of ocean acidification on marine calcifiers remains unclear, studies suggest that lower saturation states will have adverse consequences on several groups of calcifying organisms including some coccolithophore species.

Coccolithophores play a major role in the ocean carbon cycle by contributing to both the biological and carbonate pumps. They are most prominent in high latitude waters although very little is known about what controls their distribution and abundance. The main goal of this study was to collect coccolithophore diversity, abundance and calcification rate data along transects of strong environmental and carbonate chemistry gradients. Here we present data collected in June 2009 along several transects between Norway, Greenland and Svalbard. Coccolithophore abundance, diversity and calcification rates were measured and compared with macronutrients, salinity, temperature, and carbonate chemistry parameters (i.e. TA, DIC, pH, pCO_2 and Ω).

The strongest temperature gradients were observed along latitudinal transects with minimum SST values along the Greenland ice edge (T = 0-1 ºC) and maximum values along the north Norwegian coast and the south-western coast of Spitsbergen Island (T = 5-8 ºC). Surface salinity values were affected mainly by terrestrial freshwater inputs from Norway and Spitsbergen Island and ice melt along the Greenland ice edge. Saturation states of calcite and aragonite were highest along the eastern part of the study area (Ωcal = 3.4-3.9 ; Ωarag = 2.1-2.5) and lowest along the Greenland ice edge (Ωcal = 2.9-3.3 ; Ωarag = 1.8-2.1).

Eleven coccolithophore species were identified during the cruise with Emiliania huxleyi and Calciopappus caudatus being the most abundant. Coccolithophore abundance, diversity and calcification rates decreased from southeast (Norwegian coast) northward (Spitsbergen) and westward (Greenland). Coccolithophores were nearly absent in the Greenland Sea with the exception of a small number of Coccolithus pelagicus. Multivariate analysis suggests that both temperature and carbonate chemistry are at least partly responsible for the distribution and abundance of coccolithophores in the Greenland and Norwegian Seas.