-414 Observed trends of carbon storage, acidification and calcium carbonate saturation along the OVIDE section

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Session: Future of the carbon cycle: drivers, vulnerabilities, feedbacks and management options

Type of presentation: Poster

Key word:

The biannual occupations of the Greenland-Portugal OVIDE section (2002-2012) offer a unique opportunity to quantify the acidification rates and verify its impacts into the calcium carbonate saturation and alkalinity. Ocean acidification due to the uptake of a large fraction of the carbon dioxide (CO2) that is released to the atmosphere by mankind was predicted by models, which have also shown that this acidification is likely to impact calcification rates and predict trends of increase in total alkalinity (AT).

In this work, the period of time of the Pérez et al. (2010) study of the anthropogenic CO2 (CANT) storage rates in the North Atlantic is extended until 2012. The study area is divided in 3 basins: Irminger, Iceland and Eastern North Atlantic (ENA). To evaluate how the acidification affect the alkalinity and aragonite saturation trends in the main water masses, water column was divided into 5 layers delimited by density for each region. To determine those boundaries we follow the limits suggested in several works.

During the first half of the 1990s, when a high North Atlantic Oscillation (NAO) phase was dominant, the CANT storage rates in the North Atlantic subpolar gyre were ~48% higher than during the 1997-2006 low NAO phase that followed. The observed CANT storages are increasing during the OVIDE period (2002-2012), reaching similar rates that those observed during early 90' s.

Taking into account the acidification rates, this study suggests a general decrease of them from Irminger to ENA basin. For instance, the upper ENA basin layer also shows medium acidification rates, while they are non-significant for the deeper layers. The data set shows a positive trend in AT for subsurface North Atlantic waters of 0.27±0.11 μmol·kg-1·y-1 between 1981 and 2012. Models predict that the signal of the increase of alkalinity due to impact of anthropogenic CO2 on the CaCO3 pump would be detectable by 2040 in tropical and subtropical regions.

In addition, the saturation estate of CaCO3 in term of aragonite (ΩArag) shows significant negative trends in all water mass except in deep water masses. Typical negative trends of -1.5 to -3·10-3 y-1 are observed in intermediated waters which correspond with an upward migration of 5-12 m y-1 in the saturation horizons.