



Surface ocean carbon dioxide during the Atlantic Meridional Transect (1995-2013); evidence of change.

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We present more than 21000 observations of carbon dioxide fugacity in air and seawater ($f\text{CO}_2$) along the Atlantic Meridional Transect (AMT) programme for the period 1995-2013. Our dataset consists of 11 southbound and 2 northbound cruises in boreal autumn and spring respectively. Our paper is primarily focused on change in the surface-ocean carbonate system during southbound cruises. We used observed $f\text{CO}_2$ and total alkalinity (TA), derived from salinity and temperature, to estimate dissolved inorganic carbon (DIC) and pH (total scale). Using this approach, estimated pH was consistent with spectrophotometric measurements carried out on 3 of our cruises. The AMT cruises transect a range of biogeographic provinces where surface Chlorophyll a spans two orders of magnitude (mesotrophic high latitudes to oligotrophic subtropical gyres). We found that surface Chlorophyll a was negatively correlated with $f\text{CO}_2$, but that the deep chlorophyll maximum was not a controlling variable for $f\text{CO}_2$. Over the period 1995-2013 we estimated annual rates of change in: a) sea surface temperature of 0.01 ± 0.05 degrees C, b) $f\text{CO}_2$ of 1.44 ± 0.84 micro-atm, c) DIC of 0.87 ± 1.02 micro-mol per kg and d) pH of -0.0013 ± 0.0009 units. Seawater $f\text{CO}_2$ increased at the same rate as atmospheric CO_2 .