



## Variability of accumulation and storage of anthropogenic carbon dioxide in the subtropical North Atlantic.

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Recent data suggest that the accumulation of anthropogenic carbon dioxide ( $C^{anth}$ ) in the subtropical North Atlantic is not occurring at a steady rate. The comparison of carbon measurements from three transatlantic cruises across  $24.5^{\circ}\text{N}$  in 1992, 1998 and 2004 (data presented here), show that storage of  $C^{anth}$  did not increase steadily over the 12-year period; instead they suggest a large variability in the uptake of  $\text{CO}_2$  at source and subsequent carbon transport at depth as part of the ocean circulation.

The North Atlantic (NA) is a large sink for carbon dioxide, with current models suggesting that it is increasing in size as atmospheric levels rise. Most of this uptake is currently believed to take place towards the south before being transported into the NA basin in the upper limb of the meridional overturning circulation (MOC). In order to better constrain the carbon inventory and its transport as part of the MOC, a third repeat transect of  $24.5^{\circ}\text{N}$  was carried out in March-April 2004. Anthropogenic carbon fields were calculated for the three transects using a number of methods - each clearly shows the accumulation of  $C^{anth}$  in the top 1000m as well as the movement of recently ventilated waters away from their source regions. Carbon data obtained for the  $36^{\circ}\text{N}$  transect in May-June 2005 also indicate the changing dynamics of the NA sink.

These are the first carbon data to show the variability of the anthropogenic  $\text{CO}_2$  ocean system over a section in the subtropical North Atlantic over two 6-year periods (1992-1998 and 1998-2004). Differences in the change in  $C^{anth}$  are clearly apparent, and may be due to variability in ventilation conditions of source waters, changing mixing processes, and/or altering circulation pathways.