



Decline of the North Atlantic mid-latitude Sink for atmospheric CO₂ over the last Decade

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New measurements between the UK and the Caribbean (of more than 50 voyages) have shown that sea surface pCO₂ has increased significantly between the mid-1990s and the present. This increase was at a rate well above the atmospheric pCO₂ rise, reducing the uptake capability of the mid-latitude North Atlantic. The measurements were made using automated instrumentation on board commercial vessels enabling us to compare data from 2002 to the present with those of 1994 and 1995. This allows the study of changes which have taken place over a large region of the North Atlantic over almost a decade. The main increase in sea surface pCO₂ and decrease in the resulting ΔpCO₂ occurred during the minimum of the seasonal cycle of oceanic CO₂, i.e. during summer in the subpolar regions, and winter in the tropics and subtropics. Many physical and biological processes affect the North Atlantic sink of atmospheric pCO₂. We consider changes in sea surface temperature, and surface chlorophyll, but do not find compelling evidence that the change in CO₂ sink is explained by these. During the past decade a decrease in the strength and size of the sub-polar gyre, probably associated with a declining rate of deep water formation, has been reported, and we believe that these changes in the overall vertical circulation are the fundamental reasons for the decline in CO₂ sink that we observe.