



Why is pCO₂ in the North Sea rising faster than in the Atmosphere?

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The carbon cycle of the North Sea, a NW European Shelf sea, has been investigated in detail in 2001/2002 covering the North Sea by a 90 stations grid during all four seasons. Underway measurements of the partial pressure of CO₂ (pCO₂) complemented the station sampling. In 2005 the 90 stations and surface waters have been resampled again during the same period in summer in order to investigate the temporal variability of the carbon and related nutrient cycles. The atmospheric pCO₂ increased from approximately 364ppm in 2001 to 375ppm in 2005, however, the pCO₂ observations reveal that the surface water pCO₂ increased at a higher rate. This in turn means that the partial pressure difference, being the driver of the CO₂ air-to-sea flux, decreased. Similar trends have recently been reported by others for the open North Atlantic Ocean. While necessarily assuming the North Sea carbon cycle to be in steady-state during the initial evaluations of the 2001/2002 data, the consideration of the recent 2005 data allows us to identify an increase of the water column DIC inventory from 2001 to 2005, this in addition to the CO₂ exported to the North Atlantic Ocean via the continental shelf pump mechanism. Several hypotheses will be compared for the discrepancy between the rates of increase of the atmospheric and surface water pCO₂ in order to define the most likely explanation.