



A precise estimate of the anthropogenic CO₂ increase between 1981 and 2004 from observations in the mid-latitude North Atlantic.

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We use the extended Multiple Linear Regression (eMLR) approach of Friis et al. (2005) to compare total dissolved inorganic carbon (DIC) data collected during the Transient Tracers in the Ocean, North Atlantic Study (TTO-NAS) in 1981 with modern measurements from a cruise of FS Meteor in 2004. The modern cruise crossed the Atlantic at latitudes of 20 to 40 N and reoccupied the exact locations of 27 stations where DIC had been measured to high accuracy during TTO-NAS. Comparison of the eMLR estimates of DIC changes with direct comparisons of the two data sets show that the eMLR approach is not only precise but also accurate in determining decadal changes of DIC. The observed increase shows geographic patterns that are broadly consistent with the basin-wide measurements of CFCs made in 2004. Surface water increases were approx. 22 $\mu\text{mol}/\text{kg}$ and increases in the Labrador Sea Water layer were of order 7 $\mu\text{mol}/\text{kg}$. In the deep waters of the western basin, increases of more than 5 $\mu\text{mol}/\text{kg}$ were observed close to the western boundary at 20 N and were zero in the deep eastern basin below 4000m. The presentation will emphasize the implications and potential of this approach for resolving present uncertainties in oceanic anthropogenic CO₂ inventories.