



Variability of nutrients and carbon dioxide in the Antarctic Intermediate Water between 1990 and 2014

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Antarctic Intermediate Water (AAIW) formation constitutes an important mechanism for the export of macronutrients out of the Southern Ocean that fuels primary production in low latitudes. We used quality-controlled gridded data from five hydrographic cruises between 1990 and 2014 to examine decadal variability in nutrients and dissolved inorganic carbon (DIC) in the AAIW (neutral density range $27 < \sigma_n < 27.4$) along the Prime Meridian. Significant positive trends were found in DIC ($0.70 \pm 0.4 \mu\text{mol kg}^{-1} \text{ yr}^{-1}$) and nitrate ($0.08 \pm 0.06 \mu\text{mol kg}^{-1} \text{ yr}^{-1}$) along with decreasing trends in temperature ($-0.015 \pm 0.01 \text{ [U+25E6] C yr}^{-1}$) and salinity ($-0.003 \pm 0.002 \text{ yr}^{-1}$) in the AAIW. Accompanying this is an increase in Apparent Oxygen Utilization (AOU, $0.16 \pm 0.07 \mu\text{mol kg}^{-1} \text{ yr}^{-1}$). We estimated that 75% of the DIC change has an anthropogenic origin. The remainder of the trends support a scenario of a strengthening of the upper-ocean overturning circulation in the Atlantic sector of the Southern Ocean in response to the positive trend in the Southern Annular Mode. A decrease in net primary productivity (more nutrients unutilized) in the source waters of the AAIW could have contributed as well but cannot fully explain all observed changes.