



High storage rates of anthropogenic CO₂ in the Indian sector of the Southern Ocean

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Using high-quality data for CO₂-system and related properties collected 17 years apart through international observation programs, we examined decadal-scale increases of anthropogenic CO₂ along a zonal section at nominal 62°S ranging from 30°E to 160°E in the Indian sector of the Southern Ocean. In contrast to previous studies, increases of anthropogenic CO₂ were largest ($> 9.0 \mu\text{mol kg}^{-1}$) in Antarctic Bottom Water, where little storage of anthropogenic CO₂ has been reported. Significant increases of anthropogenic CO₂ in bottom and/or deep waters were detected through the section, although they became reduced in magnitude and depth range west of 110°E. Vertical distributions of anthropogenic CO₂ showed significant positive correlations with decadal-scale changes in CFC-12, a proxy of circulation and ventilation, meaning that the distributions were mainly controlled by physical processes. Comparison of increases of anthropogenic CO₂ between calculation methods with and without total alkalinity presented differences of increases of anthropogenic CO₂ west of 50°E. This is probably because decreases in production of particulate inorganic carbons in the Southern Ocean. The highest storage rate of anthropogenic CO₂ was estimated to be $1.1 \pm 0.6 \text{ mol m}^{-2} \text{ a}^{-1}$ at longitudes 130°-160°E. The results highlight storage rates higher than ever reported in the Southern Ocean, where very low storage of anthropogenic CO₂ has been evidenced.