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Testing model estimated decrease in Southern Ocean carbon sink with data over the last 30 years

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An analysis of more than 200,000 wintertime measurements of the partial pressure of CO_2 and ^{14}C of total CO_2 in the surface waters taken in the polar front region of the Southern Ocean support suggestions that meridional overturning circulation (MOC) may be increasing. Measurements of surface water CO_2between 1986 and present show that the increase in surface water CO_2 has outpaced the atmospheric increase in CO_2. Measurements of the surface water ^{14}C of total CO_2 between 1973 and present show large depletions which can be accounted for by a combination of air-sea gas exchange and increased MOC. These measurements indicate that recent ocean general circulation modeling studies forced by NCEP I reanalysis data may be underestimating the decrease in the Southern Ocean (35^{o}S) carbon sink over the last 50 years.