Temporal and spatial variations of Oceanic CO_2 partial pressure in Australian and Indian sectors of the Southern Ocean

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Quantitative evaluations of seasonal and spatial variations of oceanic CO_2 uptake in the Southern Ocean are highly required for precise understanding of global carbon cycle. With this regards, the partial pressure of CO2 (pCO_2) in the surface sea water and lower troposphere have been continuously monitored on board the icebreaker SHIRASE between Australia and Antarctica since December 1987 as a part of Japanese Antarctic Research Expedition (JARE). In addition, multi-ship observations were carried out from January to March in 2002.

Meridional distributions of pCO_2 clearly show steep changes at Subtropical Convergence, Subantactic Front, and Polar Front. Even if pCO_2 within each water mass distributed between the fronts varies to some extent, each water mass can be distinguished from the other masses by the difference of average pCO_2. The pCO_2 between Subantactic Front and Polar Front are less scattered and show secular trend at almost same increasing rate as atmospheric CO_2 concentration. The observed pCO_2 near the Antarctic coast shows steep decrease in January due to biological activity.