

**LARGE TEMPORAL AIR-SEA CO<sub>2</sub> FLUX VARIATIONS IN THE SOUTHERN OCEAN, SOUTH OF TASMANIA**

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The distribution of carbon dioxide partial pressure (pCO<sub>2</sub>) in surface seawaters South of Tasmania has been compared for two very different years; summer 1996/1997 and summer 2002/3. Field data were obtained in the summer of 2002/3 during cruises onboard the S.S. *Astrolabe* as part of an Australian-French biogeochemical observing system program, and on one cruise onboard the R.V. *Marion-Dufresne* (OISO program, France) in the frame of the long-term observational ORE/CARAUS project (INSU/IPSL). The 1996/7 data were obtained on the R.V. *Marion-Dufresne*.

The surface waters of the sub-Antarctic region showed intense CO<sub>2</sub> uptake in both February 1997 and 2003, driven by strong biological activity over the summer period (net CO<sub>2</sub> fluxes of -13.6 mmol.m<sup>-2</sup>.d<sup>-1</sup> and -12.3 mmol.m<sup>-2</sup>.d<sup>-1</sup> respectively). The summer CO<sub>2</sub> fluxes exhibit a pattern already noticed south of Tasmania. In the seasonal sea-ice zone, south of about 62°S, the CO<sub>2</sub> exchange is highly variable and appears related to the extent and evolution of the sea ice. The largest interannual change in the CO<sub>2</sub> system between February 1997 and 2003 occurred in the Permanent Open Ocean Zone (POOZ), sandwiched between the sea-ice zone and the sub-Antarctic waters to the North. The estimated fluxes in the POOZ, were -0.3 mmol.m<sup>-2</sup>.d<sup>-1</sup> for February 1997, and -20.6 mmol.m<sup>-2</sup>.d<sup>-1</sup> for February 2003. The large CO<sub>2</sub> uptake in February 2003 was associated with an increase of phytoplankton biomass and was unexpected for the high-nutrient low-chlorophyll (HNLC) waters of the POOZ. Environmental variables examined to investigate the mechanisms responsible for such a large interannual change in the air-sea flux suggest the input of iron from dust storms generated over the Australian continent in 2002/3 may have contributed to enhanced biomass and CO<sub>2</sub> uptake.