Geophysical Research Abstracts, Vol. 9, 04245, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04245

Inter-annual variability of the carbon dioxide oceanic sink south of Tasmania

A.V. Borges (1), B. Tilbrook (2), N. Metzl (3), B. Delille (1)

(1) Université de Liège, Belgium, (2) Commonwealth Scientific and Industrial Research Organisation, Marine and Atmospheric Research and Antarctic Climate and Ecosystems, Australia, (3) Laboratoire d'Océanographie et du Climat: Expérimentations et Approches Numériques, Institut Pierre Simon Laplace, France (alberto.borges@ulg.ac.be)

We compiled a large data-set from 22 cruises spanning from 1991 to 2003, of the partial pressure of CO_2 (pCO_2) in surface waters over the continental shelf (CS) and adjacent open ocean (43 to 46˚S; 145 to 150˚E) south of Tasmania. Sea surface temperature (SST) anomalies (as intense as 2˚C) are apparent in the subtropical zone (STZ) and subantarctic zone (SAZ). These SST anomalies also propagate on the CS, and seem to be related to large scale coupled atmosphere-ocean oscillations such as the Antarctic circumpolar wave (ACW) or the southern annular mode (SAM). Overall, anomalies of pCO_2 normalized to a constant temperature are negatively related to SST anomalies. This seems to be related to a depressed winter-time vertical input of dissolved inorganic carbon (DIC) during phases of positive SST anomalies, in relation to a poleward shift of westerly winds, and concomitant local decrease in wind stress. We investigate the potential effect of SST anomalies on air-sea CO_2 exchange. The general trend is an increase of the sink for atmospheric CO_2 associated with positive SST anomalies, although strongly modulated by inter-annual variability of wind speed. Assuming that phases of positive SST anomalies are indicative of the future evolution of regional ocean biogeochemistry under global warming, we show using a purely observational based approach that some provinces of the Southern Ocean could provide a potential negative feedback on increasing atmospheric CO_2.