Geophysical Research Abstracts, Vol. 7, 06218, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06218

Seasonal carbon cycling in Santa Monica Bay, Southern California

A. Leinweber (1), R. Shipe (2), H. Coleman (1), A. McDonnell (1), T. Esther (1), and N. Gruber (1)

(1) Institute of Geophysics and Planetary Physics, University of California Los Angeles, Los Angeles, USA (leinweber@igpp.ucla.edu), (2) Institute of the Environment, University of California Los Angeles, Los Angeles, USA

Time-series measurements of dissolved inorganic carbon (DIC) and related parameters were performed in the upper 300m on a bi-weekly basis from January 2003 until present in Santa Monica Bay, Southern California. These measurements reveal a strong seasonal cycle with an amplitude in DIC reaching nearly 200 μmol/kg. The corresponding pCO2 changes, calculated from the measured DIC and a salinity based estimate of the alkalinity show a seasonal change of more than 200 μatm, with a maximum around 500 μatm in later winter/early spring and a minimum of around 300 μatm in later summer. In late winter/spring, wind events can lead to local upwelling in this area. In 2003, upwelling occurred from the middle of March until the end May. The concomitant increase in sea surface DIC concentrations turned this area into a source of atmospheric CO2. This was followed by a decrease in DIC concentration due to both outgassing and DIC uptake by phytoplankton, bringing the system close to equilibrium or slightly undersaturated in CO2 with respect to the atmosphere. In 2004, upwelling only occurred in February, leading to a smaller supersaturation.

About three months after the upwelling events in 2003 and 2004, a strong surface DIC drawdown was observed. This decrease led to a strong pCO2 undersaturation in both years lasting about two to three months, most likely a result of a biological drawdown of DIC. In 2003, the DIC drawdown was observed under conditions favorable for N2 fixation whereas in 2004 it was observed during a bloom of Pseudo-nitzschia, a taxa with a high C:N ratio. In both years, these large DIC drawdowns are followed by dinoflagellate blooms.