

A SEASONAL MODEL FOR THE FLUX OF CARBON DIOXIDE  
IN ANTARCTIC COASTAL WATERS

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## Abstract

The Research on Antarctic Coastal Ecosystem Rates (RACER) program was designed to study interactions between biological and physical processes in coastal regions west of the Antarctic Peninsula. Using data from RACER cruises I, III and IV, a model was developed to quantify carbon dioxide fluxes ( $\text{CO}_2$ ) and to investigate a variety of processes known to control the concentration of dissolved inorganic carbon (DIC) in surface waters. Model results show the mean annual air-to-sea flux of  $\text{CO}_2$  is  $249 \pm 412$   $\text{mmoles m}^{-2} \text{yr}^{-1}$ . The estimated air-to-sea exchange of  $\text{CO}_2$  has a relatively small effect on replenishing DIC removed by local biological production of organic matter. Variations in the annual advance and retreat of the ice, and in the timing and duration of the phytoplankton bloom, may have a large influence on the amount of  $\text{CO}_2$  that can be transported from the atmosphere to the ocean.