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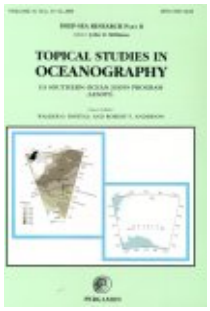
The US Southern Ocean Joint Global Ocean Flux Study (AESOPS), Guest Edited by Walker O. Smith and Robert F. Anderson



The United States Southern Ocean Joint Global Ocean Flux Study (JGOFS), also known as AESOPS (Antarctic Environment and Southern Ocean Process Study), focused on two distinct regions. The first was the Ross-Sea continental shelf, where a series of six cruises collected a variety of data from October 1996 through February 1998. The second area was the southwest Pacific sector of the Southern Ocean, spanning the Antarctic Circumpolar Current (ACC) at ~170°W. Data were collected within this region during five cruises from September 1996 through March 1998, as well as during selected transits between New Zealand and the Ross Sea. The first results of these cruises are described in this issue. The Ross-Sea investigation extensively sampled the area along 76°30´S to elucidate the temporal patterns and processes that contribute to making this one of the Antarctic's most productive seas. Hydrographic distributions confirm that stratification is initiated early in October within the polynya, generating an environment that is favorable for phytoplankton growth. Significant spatial variations in mixed-layer depths, the timing of the onset of stratification, and the strength of the stratification existed throughout the growing season. Nutrient concentrations reflected phytoplankton uptake, and reached their seasonal minimal in early February. Chlorophyll concentrations were maximal in early January, whereas productivity was maximal in late November, which reflects the temporal uncoupling between growth and biomass accumulation in the region. Independent estimates of biogenic export suggest that majority of the flux occurred in late summer and was strongly uncoupled from phytoplankton growth. The ACC region exhibited seasonal changes that in some cases were greater than those observed in the Ross Sea. Sea ice covered much of the region south of the Polar Front in winter, and retreated rapidly in late spring and early summer. Mixed layers throughout the region shoaled in summer due to surface heating, while the addition of freshwater from melting sea ice enhanced stratification in the Seasonal Ice Zone, creating conditions favorable for phytoplankton growth. For example, silicic acid concentrations decreased from initial values as high as 65 to less than 2 μM within approximately 100 km (from 65.7 to 64.8°S). Fluorescence values, however, showed less than a two-fold variation over the same distance. The vertical flux of carbon in the Polar Front area is substantial, and marked variations in the composition of exported material exited over the region. The results provide a means whereby the controls of phytoplankton growth and organic matter flux and remineralization can be analyzed in great detail.