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Seasonal and interannual variability in oceanographic processes from time-series biophysical and biogeochemical data collection in subtropical and subantarctic waters off New Zealand, SW Pacific Ocean

S. Nodder (1), P. Boyd (2), S. Chiswell (1), M. Pinkerton (1) and P. Sutton (1)

(1) NIWA, Private Bag 14-901, Kilbirnie, Wellington, New Zealand.

(2) NIWA Centre of Physical & Chemical Oceanography, University of Otago, PO Box 56, Dunedin, New Zealand (s.nodder@niwa.co.nz / Fax: +64-4-386-2153 / Phone: +64-4-386-0300)

In order to understand the temporal coupling between surface and deep ocean processes in the SW Pacific Ocean, on time-scales of days to years, two biophysical time-series moorings have been established in 3-kilometer deep subtropical (STW) and subantarctic waters (SAW), east of New Zealand, since October 2000. The moorings are at 41ºS and 46º40'S along 178º30'E and each comprise current meters, temperature loggers, temperature/conductivity sensors in the top 200 m with a time-incremental sediment trap and current meter at 1500 m water depth. Near-surface fluorometers have also been deployed periodically. These moorings have been serviced on a 3-8 monthly basis over the past seven years, generating the first detailed time-series of surface productivity and export production for temperate, southern mid-latitudes in an oceanic region that previously has been sampled only poorly.

Locally validated, remotely sensed data over the first year of the mooring deployments provide areal estimates of surface chlorophyll that were representative of longer term annual productivity cycles. In 2000-01, early spring surface chlorophyll peaks in STW were related temporally to the deposition of labile (molar C:N$\sim$7-8), bio-siliceous organic matter at 1500 m water depth. Conversely, low winter chlorophyll concentra-

tions were associated with high particulate organic carbon (POC) fluxes of moderately refractory material (C:N$\sim$9-10). This indicates that winter fluxes were affected by deep winter mixing and heterotrophic recycling processes (zooplankton exuviae, faecal pellets) and/or slowly sinking particles from the preceding autumn. In SAW, elevated POC and biogenic silica fluxes with high C:N ratios (9-13) occurred in spring, coupled with mixed-layer shoaling and moderate surface chlorophyll concentrations. Annual peaks in surface chlorophyll occurred in summer in SAW, but were associated with low biogenic fluxes, perhaps reflecting upper water column organic matter recycling within the microbial-dominated ecosystem. Substantial interannual variations in particle flux are also apparent, however, in the longer time-series from both STW and SAW sites. It is proposed to maintain the moorings as part of the Ocean SITES network for up to 10 years to allow broad comparisons to be made between the mid-latitude water masses in the SW Pacific Ocean.