Parameters obtained for the linear model derived to predict offshore atmospheric conditions from those measured at Palmer Station

Parameter	Units	Intercept	Slope	r^2
Temperature	°C	–1.51	0.594	0.636
Surface pressure	Kilopascals	–3.15	1.030	0.918
North-south wind speed	Meters per second	1.28	0.653	0.446
East-west wind speed	Meters per second	2.53	0.880	0.520

east-west winds. Once again, the linear model produces a reasonable prediction of the observed ship winds, but it underestimates the amplitude of some of the peaks.

Overall, the offshore winds are well represented by the linear model. The largest misfit is in the range of 1.3 m s^{-1}, which is not small but is within acceptable limits for many studies. This study demonstrates that it is possible to use station observations of atmospheric conditions to estimate conditions over the ocean. The values predicted from the station observations have similar amplitude and time variation as the values measured on the ship over a wide area of the shelf. The relationship must be used with caution because it would be valid only over the austral fall and may not apply to all years without additional testing. This work could be extended with longer data records and more sophisticated models. It would also be useful to have independent observation to test the quality of the prediction formulas.

This work is supported by National Science Foundation grant OPP 90-11927. Computer facilities and support were provided by the Commonwealth Center for Coastal Physical Oceanography.

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Palmer LTER: Temporal variability in primary production in Arthur Harbor during the 1995–1996 growth season

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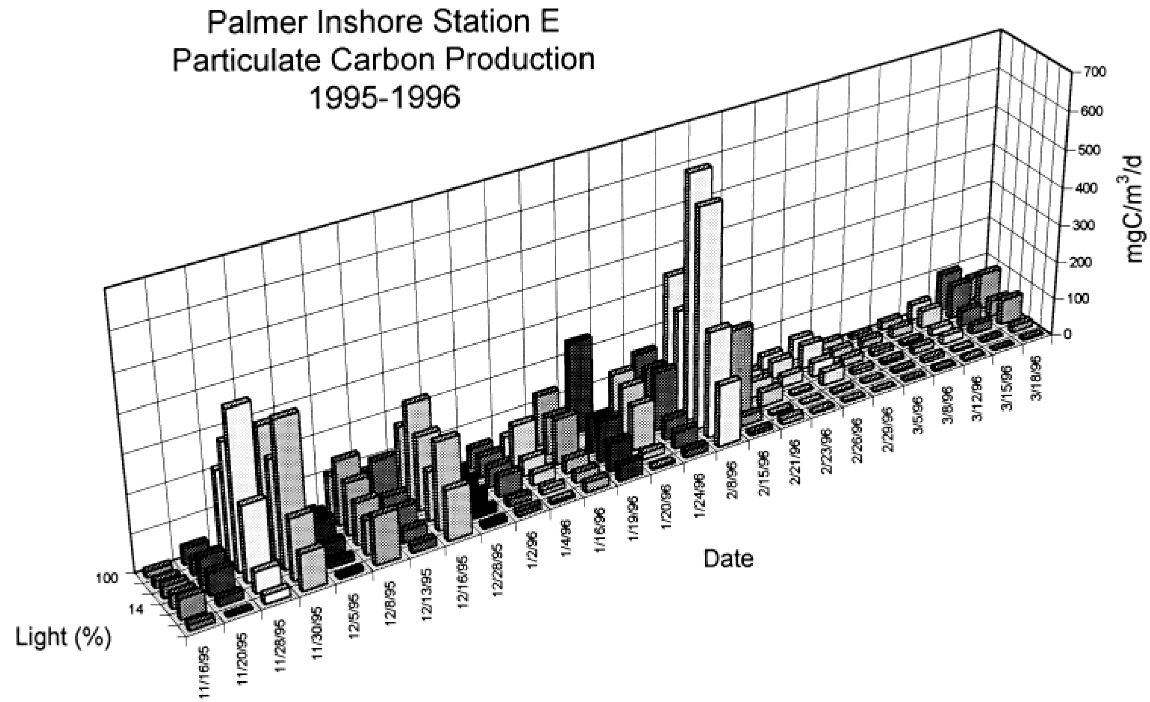
An understanding of spatial and temporal variability in primary production and its relationship to physical and biological factors is necessary to model carbon cycling in the antarctic ecosystem. The Palmer Long-Term Ecological Research (LTER) program is testing the hypothesis that the magnitude and distribution in carbon uptake by phytoplankton are linked to the extent of ice cover during the preceding winter months. This temporal variability is studied at a coastal station near Arthur Harbor on Anvers Island for 5 months to show the extent and timing of productivity in the area. The sampling represents the growth season in coastal waters of the Antarctic Peninsula, which on the average, extends from November to March in this region (Tokarczyk 1986; Smith, Dierssen, and Vernet in press).

Water samples were obtained biweekly from two stations (stations B and E in Palmer LTER inshore grid): one off Bonaparte Point, Anvers Island, and the other offshore and to the south (64°48.9'S 64°02.4'W) (Waters and Smith 1992). Samples were taken with a Go-Flo bottle at the surface and depths corresponding to 50 percent, 24 percent, 14 percent, 4 percent, and 2 percent of incident radiation. Depths were established by measuring photosynthetically available radiation with a LICOR 193-SA Quantum Sensor. Water was stored in a cooler and transported back to the station. Duplicate samples were inoculated with 5 microcuries of carbon-14–bicarbonate and incubated outside the station. Neutral nickel screens were used to simulate the corresponding light levels. Running sea water through the incubator kept the samples at *in situ* temperature. After 24 hours, samples were filtered onto a Whatman GF/F filter, acidified with 0.4 milliliters of 15 percent glacial acetic acid, and counted after addition of Universol ES. Production rates are expressed as milligrams carbon per cubic meter per day.

The major pulses in primary production in this area occur in late spring (December and January) as well as later in the summer (February and March) (Prézelin et al. 1992). The first event is generally larger and can last for a few weeks whereas the second pulse is of secondary magnitude. The 1995–1996 season blooms followed this general pattern, though the first pulse in productivity in late November and early December was slightly smaller than the second, which occurred in early February (figure). Maximum rates were observed below the surface layer (24



Primary production estimates at 64°48.9'S 64°02.4'W, based on simulated *in situ* incubations done during the 1995–1996 growth season, in units of milligrams carbon per cubic meter per day. Samples were taken at six depths corresponding to 100 percent, 50 percent, 24 percent, 14 percent, 4 percent, and 2 percent of the incident irradiance.

percent of the incident radiation corresponding to depths from 3.5 to 15.5 meters). Integrated primary production rates during these events were high: 4.41 and 6.24 grams carbon per square meter per day for 28 November and 8 February, respectively. Yearly production at this station, based on the 26 sampling dates in a growth season from 16 November to 18 March, was estimated at 279.9 grams carbon per square meter per year. Similar to the 1994–1995 season, these pulses of productivity lasted approximately 1 to 2 weeks; however, the yearly production was estimated to be 2.4 times higher and to have a deeper average depth of maximum production (24 percent of incident light in 1995–1996 vs. 50 percent in the 1994–1995 season).

Similar to 1994, the winter preceding the 1995–1996 growth season was characterized by heavy ice in the region of the western coast of the Antarctic Peninsula. This heavy ice shows in the area every 5 to 6 years (Smith and Stammerjohn in press). The high production rates observed in 1994–1995 and 1995–1996 further support the hypothesis that high primary production is associated with the ice extent.

We would like to thank Antarctic Support Associates and the members of the LTER scientific party for logistic support and assistance during the field season. This work was supported by National Science Foundation grant OPP 90-11927 to Maria Vernet.

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