Phytoplankton growth off the Western Antarctic Peninsula (WAP) begins in October, after sea ice ablation and continues through April. While global estimates of primary production (PP) in the WAP have been made based on historical data, there has been little documentation of the season and inter-annual variability occurring within these constraints.

This study attempts to address the question of temporal variability in primary production in scales of weeks to years with emphasis on what dominates the average yearly production as well as what drives the anomalies.

Estimates of daily PP and total phytoplankton biomass were collected bi-weekly as part of the Palmer LTER at Palmer Station, Antarctica (-64°S, -64°W), and we summarize here twelve years of data from 1994-2006.

### Annual Production

Figure 1: Net annual primary production measured at Palmer Station. Water from six depths was incubated for 24 hours with radiocarbon, measured production is within the ranges of those modeled for other oceanic biomes (adapted from Longhurst, 1998). Palmer LTER measured production is within the ranges of those modeled for other polar regions (Vernet and Smith, 1996-1997, 2004-2005). Years of overall low production may have a productive activity in the spring (1996-97), summer (2001-02) or later summer (2004-05). Years of larger than average production are biased to peaks of productivity in the spring (1996-97), summer (2001-02) or later summer (2004-05). A few seasons follow an average temporal distribution (e.g., 1997-98). (b) Inter-annual variability in primary production shows that few seasons follow an average temporal distribution (e.g., 1994-95). Years of larger than average production are biased to peaks of activity in the spring (1996-97), summer (2001-02) or later summer (2004-05). Years of overall low production may have a productive period (1998-99) or remain low through the season (1999-2000).

### Seasonal Production

Figure 2: Annual primary production estimates from thirteen global oceanic biomes (adapted from Longhurst, 1998). Palmer LTER measured production is within the ranges of those modeled for other polar regions (Vernet and Smith, 1996-1997, 2004-2005). Years of overall low production may have a productive activity in the spring (1996-97), summer (2001-02) or later summer (2004-05). Years of larger than average production are biased to peaks of productivity in the spring (1996-97), summer (2001-02) or later summer (2004-05). A few seasons follow an average temporal distribution (e.g., 1997-98). (b) Inter-annual variability in primary production shows that few seasons follow an average temporal distribution (e.g., 1994-95). Years of larger than average production are biased to peaks of activity in the spring (1996-97), summer (2001-02) or later summer (2004-05). Years of overall low production may have a productive period (1998-99) or remain low through the season (1999-2000).

### Modeling

Figure 3: Inter-annual variability in primary production shows that few seasons follow an average temporal distribution (e.g., 1994-95). Years of larger than average production are biased to peaks of activity in the spring (1996-97), summer (2001-02) or later summer (2004-05). Years of overall low production may have a productive period (1998-99) or remain low through the season (1999-2000).

### Factors Influencing Primary Production

Figure 4: (a) Annual cycle of phytoplankton biomass (chla) modeled from ten years of data (1996-2006), and (b) the model applied to data. The method is based on Fast Fourier Transform (FFT) spectral analysis (Wilks, 1995). The coefficients and phases corresponding to the harmonic components are obtained via multivariate analysis; this model uses the first two harmonics. Green dots represent measured chla concentration; blue lines depict the model (Diaz et al. in prep).

### References: