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PHYTOPLANKTON SIZE-STRUCTURE ON THE WESTERN SHELF OF THE ANTARCTIC PENINSULA: A REMOTE SENSING APPROACH

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The size-distribution of phytoplankton communities is one essential component which drives carbon fluxes between the atmosphere, ocean and sediment reservoirs. A long-term shift in the size-structure of primary producers might be expected in waters west of the Antarctic Peninsula (WAP) due to an ongoing warming trend that began decades ago. The Palmer Long-term Ecological Research Project (Pal-LTER) has shown larger abundance of phytoflagellates (small cells) during 'warm' (early ice retreat) years and viceversa during 'cold' (late ice retreat) years when diatoms (large cells) are dominant.

Ocean-colour sensors provide synoptic and large scale coverage data that can be applied to study these ecosystem modifications. Backscattering-based algorithms have been successfully applied to retrieve bulk particle size characteristics of field samples. However, how phytoplankton size-structure affects spectral shapes of particle (b_{bp}) and total backscattering (b_b) spectra is still an open question. The main goal of this study is to evaluate the effect of long-term climate variability on spatial patterns and magnitude of phytoplankton size-fractions over the WAP region using backscattering-based remote-sensing algorithms. Time series and horizontal distributions of SeaWiFS-derived chlorophyll *a* concentration (Southern Ocean algorithm), spectral b_{bp} (Carder et al. 1999, MODIS model), and spectral b_b (Reynolds et al. 2000 model) were generated between 1997 and 2006. Satellite spectral backscattering coefficients were validated with in situ $b_{bp}(\lambda)$ and $b_b(\lambda)$ measurements. Preliminary results showed greater values of b_{bp} and b_b spectral slopes (smaller particles) during summer of a typical 'warm' year (1999) with respect to the same period during a typical 'cold' year (2002). Consistently, lower spectral slopes of b_{bp} and b_b were found over shelf break and shelf waters of the Pal-LTER study area than in oceanic waters. Larger contributions of 'big' phytoplankton cells (> 20µm chl fraction) near Margaret Bay and northern region of WAP coincided with flatter spectral shapes of b_{bp} and b_b spectra.