

The Effect of Interannual Sea Ice Variability on Phytoplankton Communities in the Bering Sea

Ariel Tarrell¹, Helga do Rosario Gomes², Joaquim Goes²

¹ Marquette University Department of Biological Sciences, Milwaukee, WI 53233 USA

² Columbia University Lamont-Doherty Earth Observatory, Palisades, NY 10964 USA

Sea ice in the Bering Sea has a strong influence on the physico-chemical conditions of the upper water column in polar and sub-polar oceans (Alexander et al, 1981). It is responsible for altering the temperature, salinity, nutrient and trace mineral availability and stratification of the water column, as well as the amount of Photosynthetically Active Radiation that marine phytoplankton are exposed to. These modifications of the water conditions in general can enhance the growth of the phytoplankton communities. This study examines interannual variability of sea ice and its affect on the phytoplankton communities of the region. Monthly sea ice data was processed from the National Snow and Ice Data Center and from NASA's MERRA (Modern-Era Retrospective Analysis for Research and Applications) weather model from January 1997 to present to measure the variability of sea ice extent and fraction, respectively. NASA satellites SeaWiFS & MODIS were used to monitor monthly Chl *a* (Chl *a*) concentrations as an indicator of phytoplankton biomass. The data sets of Chl *a* and sea ice were used to ascertain how sea ice impacts the formation, duration, and Chl *a* levels of the spring bloom. This analysis was performed in four identified regions of interest in the Bering Sea and for the entire Bering Sea. Wide variations in the relationship between sea ice and Chl *a* were observed within each of the boxes suggesting that the Bering Sea is not a homogenous ecosystem. However, overall over the entire Bering Sea, a negative correlation was observed between these two variables. In general average spring-time Chl *a* concentrations were greatest in years of low sea-ice (2004 and 2005), whereas Chl *a* levels were extremely low in years of high sea-ice extent (2007 and 2009). An analysis of phytoplankton community density in each of the regions of interest was also performed that showed community density variation between each region in accordance with the variations observed for Chl *a*.