

Latitudinal trends of chlorophyll-a concentration and aerosol optical depth in the mid-Pacific Ocean

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Many indicators of climate change are strongly dependent on latitude, with the fastest changes generally observed at high latitudes. One trend that has been described is a global decrease in phytoplankton that is likely reflecting a decrease in the productivity of the ocean. Furthermore, the regions of the ocean with low concentrations of chlorophyll-a are expanding. Continuous global ocean color and aerosol optical depth measurements have been made by satellite since 1997. We used these data and two climate indices to investigate the latitudinal dependence of trends that have been observed in chlorophyll-a concentration in the mid-Pacific Ocean away from direct terrestrial influence. Statistically significant decreases were observed over broad extra-equatorial regions in both the northern (10-40oN) and southern (15-40oS) hemispheres. Relative changes in chlorophyll-a concentration of 10 - 40% decline were observed in this region over the 13 year satellite record. Additionally, a 10 - 30% decrease in aerosol optical depth was also found. In the northern hemisphere, the chlorophyll-a concentration decrease is related to a decrease in aerosol optical depth, and the most likely mechanism seems to be a reduction in iron fertilization. In the southern hemisphere, the cause is less clear, but multi-annual climate processes seem to be more important than aerosol trends.