THE INFLUENCE OF MESOSCALE FEATURES AND GRAZING ON PHYTOPLANKTON COMMUNITY STRUCTURE – IMPLICATIONS FOR CARBON FLUX

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ABSTRACT

Within the context of global carbon cycles, knowledge of phytoplankton community structure is essential for understanding and predicting the transport of carbon from surface waters to the deep ocean. From a combination of flow cytometric analyses and image-enhanced microscopy, the size distribution and taxonomic composition of phytoplankton communities was described and quantified for three geographical regions of interest to global carbon studies: the equatorial Pacific, the Arabian Sea and the Antarctic Polar Front. In each region, the structure of the phytoplankton community was influenced by mesoscale hydrographic features and grazing processes. In the equatorial Pacific, biomass was enhanced in the region of upwelling as well as in frontal regions between current systems. Phytoplankton assemblages were dominated by small species across the region and heterotrophic biomass exceeded autotrophic biomass in nutrient-poor waters. In the Antarctic Polar Front region, phytoplankton populations differed to the north and south of the frontal zone, as well as at the ice edge. During the spring season, phytoplankton biomass increased at the front due to *in situ* growth, with an increase in both diatoms and *Phaeocystis* spp. Later in the growth season, the accumulation of biomass shifted south as nutrient stocks were depleted. The phytoplankton assemblage showed marked variability across the region with notably different populations adjacent to one another. During two monsoon seasons in the Arabian Sea, rates of taxon-specific phytoplankton growth and mortality due to grazing were estimated from the seawater dilution technique. The dominance and growth rates of specific phytoplankton taxa differed between seasons, as did losses to protistan grazers.

During the SW monsoon season, ~10% of primary production was not grazed, most of which was attributed to diatoms. A synthesis of results from the three regions yielded a number of potential indices for the parameterization of phytoplankton community structure. However, coupled with estimates of particulate organic flux, there was no definitive relationship between these indices and flux estimates. The demonstration of such a relationship is complicated by hydrographic variability and the departure from steady state conditions.