

Back to Fronts: New Methods for Understanding Phytoplankton Dynamics

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Abstract: Phytoplankton generate about half the oxygen we breathe, and are key players in transporting atmospheric carbon dioxide into the ocean through photosynthesis. Phytoplankton biomass is often significantly enhanced at fronts, which are regions of strong horizontal density gradients in the ocean. It is possible that fronts are disproportionately important to phytoplankton-mediated carbon fluxes in the ocean, and there is evidence that fronts may be increasing in frequency over the last few decades. While we know that the amount of phytoplankton is usually enhanced at fronts, we have only a superficial understanding of why. The answer lies in measurements of the biological rates – growth and grazing – at the front. Unfortunately, such rate measurements are very difficult to make. Here I describe two techniques we have developed to estimate biological rates at fronts using properties that are easy to measure in the field. I will show that different fronts have different balances of rates, and that the phytoplankton patch emerges through a combination of physically forced enhanced growth and decreased grazing at the front.