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Eddies influence biogeochemical cycles through the excitation of vertical velocities within their interiors and the horizontal advection of nutrients and ecosystems, either around the eddy periphery by rotational currents, or by the trapping of fluid within eddy interiors. In this study, we present an analysis of the influence of mesoscale ocean eddies, identified and tracked by their sea surface height signatures observed by a series of satellite altimeters on near-surface chlorophyll (CHL) as estimated from ocean color measured by the SeaWiFS sensor.

The influence of mesoscale eddies on CHL varies regionally, with cyclonic eddies generating positive CHL anomalies and anticyclonic eddies generating negative CHL anomalies in most boundary current regions. In some regions, such as the South Indian Ocean and oligotrophic South Pacific Ocean, anticyclonic eddies generate positive CHL anomalies and cyclonic eddies generate negative CHL anomalies. The observed regional variability of the influence of eddies on CHL is analyzed in an eddy-centric frame of reference in a series of six study regions.

Mechanisms by which eddies can influence phytoplankton communities are described and regions where the observed CHL response to eddies is in agreement with any subset of these mechanisms are discussed. This study does not attempt to definitively link the observed regional variability to any particular mechanism, but provides a global overview of how eddies influence CHL anomalies and presents an observations basis upon which coupled bio/physical ocean circulation models can be assessed.
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