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Ocean color seasonal variability of the western tropical Pacific basin

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Ocean color data from the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) satellite were used to document the seasonal cycle of surface chlorophyll concentration in the western tropical Pacific during the SeaWiFS years (1997-2003). Most of the eastern part of the region is occupied by High Nutrient-Low Chlorophyll (HNLC) waters of the equatorial upwelling divergence, while the western part is oligotrophic. The western Pacific is known for low seasonal variability of wind, surface current and temperature. Nevertheless, seasonal disruption of oligotrophy shows up in three regions: the oligotrophy/upwelling transition zone, the Solomon Islands and the nascent North Equatorial Counter Current (NECC).

We used sea surface temperature (SST), sea level anomaly (SLA), winds, and surface currents from satellite data and satellite-derived products to investigate some causes for the seasonal variability of the surface chlorophyll. Horizontal advection is a key process for chlorophyll changes observed at the northern boundary of the mesotrophic waters of the equatorial divergence. To a lesser extent, horizontal advection is also one of the processes driving chlorophyll variations at the southern boundary. Around the Solomon Islands, a chlorophyll increase of about 0.1 mg m^{-3} is observed southwest of the islands during austral winter while the chlorophyll concentration remains at a background value of about 0.1 mg m^{-3} north of the islands. Low SLA and surface currents favorable to upwelling in the lee of the islands act to enhance the biological activity. Chlorophyll enrichments are observed in the meanders of the western NECC on a seasonal basis. They are seen especially between December and June. The seasonal chlorophyll maximum is associated with the seasonal SST minimum and the maximum NECC velocity. Satellite data do not allow us to determine mechanisms

driving the chlorophyll increase. Possible explanations are horizontal advection of nutrient and/or phytoplankton from the Halmahera region and local upwelling associated with current meandering.