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Particulate organic carbon in the global ocean: comparison of ocean color satellite and in situ estimates

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The objective of this study is to compare available historical in situ particulate organic carbon (POC) data sets with POC ocean color data products from SeaWiFS and MODIS Aqua. This study is part of our broader effort aimed at determination of POC reservoirs in the ocean on global and regional scales using ocean color data. Here we present example results obtained by examining historical data from Bermuda Atlantic Time Series (BATS), Carbon Retention in a Colored Ocean (CARIACO), Atlantic Meridional Transect (AMT) dataset, the Gulf of Maine North Atlantic Time Series (GNATS), Polarstern cruises ANT-XXIII/1 and ARK XIX/2, the M/S Scotia Prince Ferry cruises, Biogeochemistry and Optics South Pacific Experiment (BIOSOPE), San Diego Coastal Project, the Tropical Atmosphere Ocean (TAO) mooring array, Calcofi, Joint Global Ocean Flux Study (JGOFS) in the Ross Sea, and the Hawaii Ocean Time-series (HOT). For each region we show statistical relationships between the in situ and the satellite determined POC concentrations. Our results indicate that the highest overestimation of satellite derived POC in comparison to in situ data was observed for GNATS, while the most significant underestimate was noted for Cariaco. The BATS data with consistently low POC are characterized by relatively weak correlation between satellite and in situ data. For the examined regions, the correlation between the in situ and satellite derived POC concentrations based on all data pooled together is degraded compared to regional correlations. In conclusion, our analysis shows that the agreement between the in situ and satellite POC determinations changes regionally (and likely also seasonally). Our results draw attention to the limitations of the global ocean color POC algorithm, although these limitations are not necessarily significantly more severe than those present in commonly used chlorophyll algorithms.