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Environmental Controls on Sea Spray Aerosol Production

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Understanding sea spray aerosol (SSA) production is needed to accurately represent its influence on climate. Using satellite data, we investigate the factors controlling production of the coarse mode of aerosol optical depth (AODc), a proxy to SSA, over the pristine South Pacific Gyre. The analysis was done over daily, seasonal, and inter-annual timescales. We found that the link between AODc and wind speed (W) depends on the timescale under consideration. AODc and W are positively correlated on both daily and inter-annual time-scales, while significantly anti-correlated on the seasonal time-scale. The seasonality in the AODc-W correlation suggests significant contribution of other environmental factors. Indeed when considering other key factors, on a seasonal timescale, a clear negative correlation between SSA and chlorophyll-a concentration (Chl-a) emerges. Further analysis shows that for a given value of W, AODc yield is significantly reduced when the Chl-a concentration is high, revealing a secondary, albeit important role of marine biological activity in SSA production.