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Physical drivers of patterns in autumn—winter chlorophyll variability from Saildrone measurements in the Southern Ocean

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The first autonomous surface vehicle (Saildrone) circumnavigation of Antarctica revealed spatio-temporally variable chlorophyll with occasionally high concentrations in late autumn/early winter. Low light availability at this time of year makes high chlorophyll concentrations unexpected and the patterns of variability hint at physical processes, such as submesoscale fronts, controlling chlorophyll distributions. Here, we assess the physical drivers of spatio-temporal chlorophyll distribution measured by the Saildrone. Together with large-scale variability in surface heat and light, we identify submesoscale (0.1-10 km) frontal activity and regions of high eddy kinetic energy to characterize possible physical drivers of the observed variability in chlorophyll. Autonomous platforms measuring oceanic variables at fine spatial and temporal resolution are enabling new discoveries, such as this one, and open the door to understand the impact of submesoscale flows on the local ecosystem.