Wednesday, October 10
Poster Session 3
16:00–18:00

Poster 171
DELAYED ISLAND EFFECTS CAN TRIGGER NITROGEN FIXER BLOOMS

The southwest tropical Pacific is characterized by low chlorophyll concentrations (typically below 0.1 mg m^{-3}) and depleted surface nutrients. In this mostly unproductive region, chlorophyll concentration however often increases in the vicinity of oceanic islands. These enrichments are caused by nutrient inputs by island-driven processes such as upwelling and mixing in lee eddies, island runoff, or iron enrichment from the island platform. This "island effect" is very common across the tropical Pacific, and is generally identified by inverse relationships between chlorophyll and distance to an island. Here we revisit the island effect using satellite chlorophyll, in situ observations collected during the 2015 OUTPACE campaign, and a simple model. We demonstrate that a second type of island effect exists, where the phytoplankton response is decoupled in time (several weeks) and space (hundreds of km) from the island-driven nutrient enrichment. This decoupling happens when nitrate is limiting, N:P ratios are low, and excess iron remains in the water masses after an initial bloom (the "classical" island effect). Slow-growing nitrogen fixers then start utilizing leftover iron and phosphate while water masses get advected away from the island. As a result, chlorophyll concentrations increase again and peak weeks later ("delayed" island effect). Such blooms can be very intense with chlorophyll concentrations over 10 times the average concentration in the region. This study suggests that the fertilizing effect of islands on phytoplankton and primary production may have been largely underestimated.

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