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Does Chlorophyll affect ENSO predictions?

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In this work we explore the use of SeaWiFS ocean color observations to parameterize the effects of the biogenic heating for climate simulations of the tropical Pacific Ocean with a coupled ocean-atmosphere model.

The model used is a hybrid coupled model, recently developed at the Earth System Science Interdisciplinary Center (ESSIC) at University of Maryland, by coupling an Ocean General Circulation Model (OGCM) with a statistical atmosphere model for wind stress anomalies. The impact of the seasonal cycle of water turbidity on the annual mean, seasonal cycle and interannual variability of the coupled system is investigated using three simulations differing in the parameterization of the vertical attenuation of downwelling solar radiation: i) a control simulation (HP17) using a constant 17 m attenuation depth; ii) a simulation with the spatially-varying annual mean of the satellite derived attenuation depth (HPAM); and iii) a simulation accounting for the seasonal cycle of the attenuation depth (HPSC).

The results indicate that a more realistic attenuation of solar radiation impacts both the annual mean and seasonal cycles, reducing the errors in SST, and thermocline depths, resulting in some improved currents. The interannual variability of the HCM is significantly improved only when the seasonal cycle of the attenuation depth is used (HPSC). The seasonal cycle of the attenuation depth interacts with the low frequency equatorial dynamics to enhance warm and cold anomalies, which are further amplified via positive air-sea feedbacks. Our results also suggest that interannual variability of the attenuation depths is required to capture the asymmetric biological feedbacks during cold and warm ENSO events.