

South-East Madagascar Phytoplankton Bloom: A modelling perspective

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The region around Madagascar is a very complex one consisting of the poleward-flowing East Madagascar Current, the shallow-eastward South Indian Ocean Countercurrent, and mesoscale eddies. However, of more particular interest is the offshore south-eastern part of Madagascar which is a region of biologically oligotrophic habitat. A unique aspect of it is the occurrence in the basin of a sporadic austral summer phytoplankton bloom, one of the largest in the world, and which has a substantial temporal and spatial variability. A coupled high-resolution physical-biogeochemical model is used, for the first time, to help gain some more insight on the causation of this bloom. The model was able to reproduce an infrequent sub-surface (20-40 meters) bloom, but with surface signatures occurring only in some of these blooms. The impact of eddy-current modulations on the offshore transport of coastally produced phytoplankton cells and nutrients has been investigated. An analysis of additional influences of 3-D mesoscale processes in regards to fluctuations in vertical nutrient fluxes is also performed to explain the initiation and intensification of these blooms, and the absence of surface chlorophyll-a signature during some of these blooms.