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Structuration of phytoplankton communities by lateral stirring

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Observations of phytoplankton groups show a strong spatial and temporal structuration at the mesoscale and below, rising questions on the dynamics that drives this variability. While this problem has been approached in the past with models or in-situ observations, here we explore the possibility of combining global observations, namely SeaWiFS data reprocessed by the PHYSAT algorythm and altimetry data analysed by Lagrangian tools. The PHYSAT algorythm allows to estimate from ocean color images the predominant phytoplankton group in each pixel, producing high-resolution snapshots of the spatial structure of phytoplanton communities. On the other hand, altimetry data allows to reconstruct the effect of the horizontal stirring on an advected tracer, estimating with backtrajectories the origin of a water mass and locating transport barriers with tools like the Lyapunov exponent.

By combining PHYSAT-reprocessed SeaWiFS data and altimetry data, here we address the problem of the structuration of plankton communities by the horizontal transport, asking in particular the following questions: What is the role of horizontal stirring in creating boundaries between different communities? Does the predominance of a group occurr because of local competition or because of invasion? These questions are studied for two cases studies, one in the South Atlantic and one in the Indian ocean, where the relatively cloud-free conditions allow to follow the development of group patches along trajectories.