Geophysical Research Abstracts
Vol. 19, EGU2017-14468, 2017
EGU General Assembly 2017

Modeling the dynamical sinking of biogenic particles in eastern-boundary upwelling systems

Vincent Rossi (1,2), Pedro Monroy (2), Cristobal López (2), Emilio Hernández-García (2), Boris Dewitte (3), Aurélien Paulmier (3), and Véronique Garçon (3)

(2) IFISC (UIB-CSIC), Palma de Mallorca, Spain (vincent@ifisc.uib-csic.es), (1) Mediterranean Institute of Oceanography, CNRS UMR 7294, Campus de Luminy, 13288 Marseille, France., (3) Laboratoire d'Étude en Géophysique et Océanographie Spatiales, CNRS/IRD/CNES/UPS, 14 Av. E.Belin, 31400 Toulouse, France.

Although most of the organic material produced by photosynthesis in the upper ocean is recycled in surface waters, a significant portion sinks into the deep ocean where it is stored for long time-scales. Knowledge of the export flux of organic carbon from the sea surface to depths is needed to estimate the efficiency of the biological carbon pump, a key process of global carbon cycling. We study how the sinking of biogenic particles produced in the euphotic layer is affected by subsurface ocean currents as derived from a regional dynamical model. In the range of sizes and densities appropriate for marine biogenic particles, the sinking trajectories are given by the equation of motion of small particles in a fluid flow (Maxey-Riley equation). We use a modelled 3-dimensional velocity field with major energetic structures in the mesoscale and we assess the influence of physical processes such as the Coriolis force and the inertia of the particles. We find that the latter forces are negligible as compared to the most important terms, which are passive motion with the velocity of the flow and a constant added vertical velocity due to gravity. Horizontal two-dimensional clustering is observed at depth, similar to the inhomogeneities observed in sinking ocean particles. Based on ensemble experiments, we explore the influence of the mean flow and the mesoscale eddy field on particles lateral advection and size fractionation. This modeling framework allows us to extend the concept of particle source funnels and helps interpreting particles fluxes estimated from sediment traps deployed in upwelling systems, informing the spatial mismatch between surface production and particle export.