EGU24-12177, updated on 15 Sep 2024
https://doi.org/10.5194/egusphere-egu24-12177
EGU General Assembly 2024

Mesoscale and submesoscale biogeochemical signatures in a high-resolution ocean model (ICON-O/HAMOCC)

Lucas Casaroli[1], Tatiana Ilyina[1,2], Nuno Serra[2], and Fatemeh Chegini[1,2]
[1]Max Planck Institute for Meteorology, Ocean in the Earth System - Biogeochemistry group, Hamburg, Germany (lucas.casaroli@mpimet.mpg.de)
[2]University of Hamburg

Within the oceanic mesoscale and submesoscale spectral ranges, energetic phenomena unfold which include eddies, fronts, filaments and internal waves. Those intricate features significantly impact the biogeochemical cycles. For instance, they contribute to the vertical transport of nutrients to the euphotic zone, modify the mixed layer depth through vertical displacement of isopycnals, and play a pivotal role in shaping the patchiness of phytoplankton. Many ocean biogeochemical models are constrained by computational resources, limiting their ability to resolve the complex details of high-resolution processes. In this study, we introduce a state-of-the-art ocean biogeochemical model (ICON-O/HAMOCC) with a uniform 10-km resolution. Our results show the impact of vortical structures on oxygen, phytoplankton, and carbon. The model solution highlights a robust signal of Tropical Instability Waves (TIW) in biogeochemical tracers in the Equatorial Pacific. We assess the seasonal and interannual variability of this signal, demonstrating the significant role of eddies in ocean oxygenation and in the carbon cycle.