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APPLICATIONS OF MESOSCALE DYNAMICS: Impacts of vertical motion on nitrate distribution

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The objective of this study is to improve our understanding of the influence of mesoscale vertical exchanges on ecosystem dynamics. In particular, we aim to investigate the influences of vertical velocity on ocean nitrate distribution in the South Equatorial Pacific. Previous remote sensing studies in this region have revealed that chlorophyll distributions within mesoscale eddies are characterised by dipole-like patterns, with extreme values found at the eddy peripheries.

We use in-situ data to obtain an estimate of 3D currents. Horizontal 2D velocities are derived from application of the thermal wind equation to 3D fields of temperature and salinity obtained from the ARMOR3D reanalysis that combines satellite (SST and altimetry) and in-situ (Argo profiling floats, XBT, CTD and mooring) data. Vertical velocities are estimated from quasi-geostrophic (QG) dynamics by integrating the QG Omega Equation. Finally, a Lagrangian particle tracking model, forced by the derived 3D currents, is used to study passive tracer dispersion and its influence on the distribution of biochemical properties such as nitrates. Preliminary results show that the vertical velocity component can explain $\sim$40% of the anomalies in nitrate distributions at 200m depth after 8 weeks of simulation.