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Impact of mesoscale variability on mixed layer depth and phytoplankton bloom in Kerguelen region

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The Kerguelen Plateau is a shallow submarine plateau of great meridional extent ($\sim$16° between 46°S and 62°S) located in the Indian sector of the Southern Ocean and surrounded by deep basins. This plateau forms a natural barrier to the Antarctic Circumpolar Current (ACC) which exhibits strong meandering and eddy activity. A phytoplankton bloom, with a strong interannual variability is observed downstream Kerguelen plateau. The large scale circulation pattern of this area is well known from recent field campaigns but little is known about the impact of mesoscale activity on the spatial and temporal variability of Kerguelen phytoplankton bloom. In particular, mesoscale activity is likely to strongly control the spatial patterns and the interannual variability of mixed layer depth downstream the plateau and therefore affect the phytoplankton bloom properties.

Here, we investigate the impact of mesoscale dynamics on mixed layer depth and phytoplankton bloom downstream Kerguelen plateau. To this purpose, a regional modelling study of the South Indian Ocean dynamics and biogeochemistry is carried out. Two model experiments based on NEMO-PISCES are run over the period 2000-2011 : one at low resolution (0.5°) and one at higher eddy-resolving resolution (1/12°). First, the impact of model resolution on the simulated surface circulation is evaluated against available observational datasets. Second, the changes in mixed layer depth spatial distribution and temporal variability with increasing model resolution are investigated. Finally, we discuss how phytoplankton bloom onset and duration are affected by changes in mixed layer depth due to model resolution. These results will help understanding the mechanisms controlling the interannual variability of Kerguelen bloom.