



## **Impact of resolved scales on global marine biogeochemical models**

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Here we examine the impact of resolving mesoscale processes on the global marine biogeochemical system by performing simulations at two different resolutions,  $2^\circ$  (LO-res) and  $1/4^\circ$  resolution (HI-res) using the PELAGOS model. Both the LO-res and HI-res simulations are set up with the same forcings and biogeochemical parameterizations, while the initial conditions are provided by a spinup of the LO-res simulation. This allows us to perform a direct inter-comparison of the two cases with a view to understanding how the introduction of mesoscale features affects the biogeochemical system, specifically how differences in the resolved horizontal and vertical motions are reflected in the plankton biomass and the nutrient availability. While the global large-scale oceanographic features (fronts, gyres, etc) are captured in both the LO-res and HI-res simulations, differences in the mesoscale flow structures, and in particular the resolved vertical physics in the HI-res simulation generate very different behaviour in the biogeochemical system. These differences in the physics drives what is a spun-up biogeochemical system in the LO-res simulation into a new regime in the HI-res simulation with significant reduction of typical low resolution biases. Coastal features are well reproduced due to stronger Ekman upwelling at the continental margins and increased eddy kinetic energy in the Southern Ocean reduces the winter overestimation. These biases in the model are a result of inadequate vertical dynamics.