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Improved representation of oxygen distributions in the Tropical Atlantic on switching from 0.5 to 0.1 degree resolution

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The oxygen distribution in the ocean is the result of complex interactions between biogeochemistry and water mass circulation. Remineralization of sinking organic material consumes oxygen in the ocean interior, while physical transport tends to resupply oxygen by advective or diffusives processes. An oxygen minimum is commonly observed at the eastern basin boundaries of the tropical oceans, which are characterized by both large organic matter export and weak interior ventilation. Most of state-of-the-art coupled biogeochemical - circulation models fail to realistically reproduce the oxygen distribution and, in particular, overestimate the suboxic water volume. In this study, we assess the impact of horizontal resolution on suboxia extension, by comparing two experiments realized using the NEMO-NPZD coupled circulation biogeochemical model at coarse (0.5 degree) and eddy resolving (0.1 degree) resolution. We focus on the Tropical Atlantic Ocean. While the coarse configuration experiment displays the common bias of a too large and too intensive oxygen minimum, the modeled oxygen distribution is much closer to observations in the eddy resolving experiment. In this latter experiment, the coastal upwelling is stronger, impacting the equatorial current system and particularly the Equatorial Undercurrent extension. The equatorial region is better ventilated, which enhances the oxygen supply and essentially eliminates the bias of too low oxygen found in previous coarser resolution models.