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Impact of biogeochemistry feedbacks on the projected climate change signal over the Indian Continent

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There are few studies dedicated to assessing the impact of biogeochemistry feedbacks on the climate change signal. In this study, we evaluate this impact in a future climate change scenario over the Indian subcontinent with the coupled regional model ROM in the Indian CORDEX area.In ROM a global ocean model (MPIOM) with regionally high horizontal resolution (up to 15 km resolution in the Bay of Bengal) is coupled to an atmospheric regional model (REMO, with 25 km resolution) and global terrestrial hydrology model. The ocean and the atmosphere are interacting within the region covered by the atmospheric domain. Outside this domain, the ocean model is not coupled to the atmosphere, being driven by prescribed atmospheric forcing, thus running in so-called stand-alone mode.

To assess the impact of biogeochemical feedbacks on the climate change signal, we compare two simulations with ROM. In both simulations, the model is driven by data from a climate change simulation under the RCP 8.5 scenario with the MPI-ESM global model and differ only in the activation of the biochemistry module of MPIOM. In the first simulation, we use a light attenuation parameterization based on the Jerlov water types, when the attenuation coefficient varies spatially depending on the water type specified but does not vary in time. In the second simulation, we introduce the biochemical feedbacks as implemented in the global ocean biogeochemistry model HAMOCC.

Both simulations capture the main features of the present time atmospheric and oceanic variability in the region and the model with HAMOCC reproduces well the intra-annual dynamics of the marine ecosystem in the northern Indian Ocean.

A comparison of the simulated changes in atmospheric variables shows that the feedbacks have a substantial impact on the climate change signal for precipitation and air temperature, especially over the central Indian region.

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