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Projected climate change in the South Asia and northern Indian Ocean by the end of the 21st century as obtained from a Regional Earth System Model

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Detailed atmospheric, ocean physical and biogeochemical characteristics for the period 2015-2100 within the South Asia CORDEX domain have been obtained from simulations of the Regional Earth System Model ROM.

Comparative analysis of average climatic characteristics for the past (1975-2004) and future (2070-2099) climates has been carried out. It shows significant future SST increase, reaching 3°C on average, over the considered area. The salinity of the ocean's upper layer will decrease by 1 ‰ on average, which indicates a change in the precipitation-evaporation balance in the future climate. The simulated annual MLD will decrease by 5 m in the future. However, this MLD change will be strongly irregular, both in time and space. Simulations also show a widespread decrease of the chlorophyll-a concentration in the surface layer (up to 2 mg Chl m⁻³) in the future, especially pronounced in the northern and western parts of the Arabian Sea. It is a significant change, given that absolute chlorophyll-a concentration in these areas is typically 3-4 mg Chl m⁻³ in spring and 5-8 mg Chl m⁻³ in summer, as obtained for the 1975-2004 model run. The model also shows that the chlorophyll-a concentration at the surface will decrease by 1-2 mg Chl m⁻³ along the western coast of the Bay of Bengal in the future. The relative decrease in the surface chlorophyll-a concentration will be about 40% in the future climate in the Arabian Sea and the Bay of Bengal.

The model solution according to the SSP5-8.5 scenario shows a decrease in the amount of precipitation in the future climate (up to 3-4 mm/day) over the northeastern part of India and over Nepal in summer. But over the central part of India, in the Andaman Sea, over Thailand and Myanmar, there will be an increase in the amount of precipitation. The total continental runoff into the Bay of Bengal will increase, but the runoff in the Ganges delta will be greatly weakened. Thus, despite the decrease in the runoff of the Ganges and Brahmaputra rivers, the total continental runoff into the Bay of Bengal turns out to be higher in the future climate (2070-2099) relative to retrospective calculations (1975-2004) due to the runoff of smaller rivers.

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