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Precipitation impacting upper-ocean currents: an analysis using a km-scale Earth System model

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In this study, we assess the impact of precipitation on the ocean current acceleration using an Earth System model resolving deep convection and ocean eddies using a horizontal grid spacing of 5 km. Punctual studies using observations show that precipitation events with intensities higher than 24 mm d^-1 could impact the upper-ocean dynamics. Basically, the increase in buoyance flux equals half buoyancy resulting in the absorption of shortwave radiation (200 W m-2) under clear sky conditions. Due to the spatial sparse of observational sites, there is still the question of whether this number holds only in specific locations. With a grid spacing of 5 km, the simulation shows that precipitation events in the tropical Atlantic with a mean intensity greater than 20 mm d-1 impact tremendously in the stratification due to salinity in the upper ocean with two consequences. First, the mixed layer depth shallows, even in cases with strong wind forcing. Second, the momentum trapped in this shallow layer accelerates the surface currents. This is also accompanied by an increase in the turbulent kinetic energy in the mixed layer depth. These results point to the fact that precipitation, in particular in the deep tropics, could impact the upper ocean dynamic.