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Macrophysical impacts of cloud microphysics in LES of shallow oceanic convection

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Tropical and subtropical oceanic shallow convection plays an essential role in the Earth climate system and holds the key to the climate change. Effects of cloud microphysics (e.g., the size of cloud droplets) on macrophysical properties of shallow clouds (e.g., the mean cloud cover) continued to be of a significant interest of the cloud physics and climate change communities. The overall goal is to develop understanding and eventually credible parameterizations of such effects in large-scale (e.g., climate) models. This presentation will discuss a set of LES simulations applying a bin microphysics model and based on BOMEX model setup, using contrasting CCN concentrations, and including/excluding growth of cloud droplets by collision-coalescence (i.e, with and without drizzle/rain). Precipitating cases consider either purely gravitational collisions or enhancements due to small-scale cloud turbulence. The analysis highlights feedbacks between the cloud field and mean thermodynamic profiles (as documented by changes in CAPE) and the impact of rain processes, significantly enhanced by the effects of cloud turbulence on collision-coalescence. These results will be put in the context of past studies, such as investigations into the first and the second indirect aerosol effects and the entrainment-evaporation feedback.