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Effects of aerosol particle emissions on precipitation formation simulated with UCLALES-SALSA

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The release of large soluble aerosol particles (in the $1\ \mu\mathrm{m}$ size range) to boundary layer clouds is known to strongly influence the rate of formation of precipitating droplets. This is due to the rapid growth of the emitted particles via condensation of water vapor and subsequently by enhanced collision-coalescence. Emission of large aerosol particles can occur naturally as salt particles are suspended in the boundary layer from sea spray. In another context, in areas of limited rainfall, cloud seeding field experiments have been performed with the goal of artificially enhancing the total accumulated rainfall. However, the exact response of precipitation to naturally occurring emissions of large particles or artificial cloud seeding in varying conditions remains uncertain. In this work, we employ the latest version of the state-of-the-art aerosol-cloud microphysical model coupled with a large-eddy simulator, the UCLALES-SALSA. The elaborate spectral bin representation for aerosol, clouds and precipitation alike, now including a scheme for natural as well as artificial aerosol particle emissions both from surface and aloft, provide a unique tool to study the aerosol-precipitation interactions. In particular, UCLALES-SALSA model simulations are compared with experimental results obtained from aerosol seeding of marine stratocumulus clouds as reported by Jung et al. (2015; ACP).