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Aerosol-cloud interaction signal in a meteorological ensemble of convective precipitation from COPE

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Various modeling studies and theoretical considerations of cloud systems suggest a profound impact of aerosols changes on cloud dynamics and precipitation amounts and pattern. However, observations of aerosol impacts on precipitation in daily weather remain elusive. Part of the difficulty to observe changes in precipitation patterns or amounts to different aerosol concentrations is related to the co-variability of atmospheric conditions and aerosols in the real atmosphere. To address this issue we conducted high-resolution (1km and 250 m horizontal resolution) ensemble simulations of convective clouds observed over the southwest peninsula of the UK during COPE with a variety of aerosol profiles applied to a meteorological ensemble. The control model simulation compare very well with observational data from the COPE campaign including 3D radar data and aircraft measurementse. Properties used for the investigation of the cloud-precipitation system in these simulations are precipitation rate, precipitation amount, cell size, number and lifetime and cloud depth. The approach allows us to evaluate whether there is any statistically significant signal of changes due to perturbations in the aerosol conditions or whether the variability in the cloud-precipitation system is dominated by the initial condition perturbations.