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Impacts of Saharan dust on the microphysical processes in tropical convection

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Cloud resolving model simulations of idealized tropical convection are performed to examine the influence of Saharan dust intrusions on the microphysical structure and precipitation formation processes within varying convective environmental conditions in the tropics. Simulations are initialized with dropsonde profiles retrieved during the NAMMA field project in the eastern tropical Atlantic during the summer of 2006. A series of vertical profiles obtained on Aug 30 and Sep 1, 2006 provide south to north transects from a zone of deep tropical convection to clear sky conditions. Representative simulations, therefore, encompass a range of tropical precipitation systems from deep to shallow convection. Within the idealized modeling framework, a set of sensitivity simulations, relative to a control run, are performed in order to better understand the role that dust particles play on these convective systems. To simulate the droplet nucleating properties of the dust, its hygroscopicity is varied, thus representing varying amounts of soluble material. Higher cloud droplet concentrations resulting from the introduction of dust lead to modifications of the cloud droplet distribution and growth of precipitation sized hydrometeors. Additionally, new parameterizations for the action of dust as freezing and deposition ice nuclei are included. Changes to the droplet and ice crystal distributions lead to changes in the hydrometeor condensation and evaporation rates as well as the latent heating profiles within the convective clouds. These perturbations to the initial system then generate dynamic feedbacks within the convection. A microphysical budget analysis of the dust effects on a range of convective systems will be presented.