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Large-eddy simulation of the transient and near-equilibrium behavior of precipitating shallow convection THIJS HEUS, Cleveland State University, AXEL SEIFERT, Deutscher Wetter Dienst, Offenbach, Germany, ROBERT PINCUS, University of Colorado, BJORN STEVENS, Max Planck Institute for Meteorology, Hamburg, Germany — Cloud-aerosol remain one of the largest uncertainties in climate modeling. Many of the postulated cloud-aerosol interactions involve precipitation to limit cloud size and life time, in particular for barely precipitating shallow cumulus clouds. If the precipitation exceeds a certain threshold, it will create feedback on the cloud field through cold pools and mesoscale organization. Such mesoscale responses have mostly been ignored so far in the discussion of aerosol indirect effects. We study the sensitivity of trade wind cumulus clouds to perturbations in cloud droplet number concentrations. Over time, the cloud system approaches a radiative-convective equilibrium state. The transient behavior and the properties of the near-equilibrium cloud field depend on the microphysical state and therefore on the cloud droplet number density. The primary response of the cloud field to changes in the cloud droplet number density is deepening of the cloud layer, and results in a shorter cloud life time. If the atmospheric time scales are long enough compared to the microphysical time scales, the cloud field may reach a near-equilibrium regime. In this regime, the decrease in cloud cover compensates much of the brightening of the clouds, and the overall effect on the albedo is small.

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