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Daytime convective development over land: the role of surface forcing

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Diurnal cycle of solar radiation over tropical and midlatitude summertime continents forces strong evolution of atmospheric convection. As surface sensible and latent heat fluxes increase after sunrise, a dry convective boundary layer develops in the early morning hours. It proceeds with the formation of shallow convective clouds as the convective boundary layer deepens and may eventually lead to the transition from shallow to deep precipitating convection. Factors affecting shallow-to-deep convection transition have been studied in that past, but the early evolution of dry convection and how it affects development of shallow convection and eventual transition to deep convection attracted much less attention. This presentation will discuss a set of large-eddy simulations that considers the impact of the surface flux Bowen ratio, the partitioning of the surface heat flux into sensible and latent components, on the development of dry and eventually moist convection. The key point is that the Bowen ratio affects the surface buoyancy flux and thus growth of dry convective boundary layer before the moist convection onset. This has a strong impact on the development and organization of shallow convection and eventual transition to deep convection. Details of the simulation results will be discussed at the conference.

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