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The transition of stratocumulus to shallow cumulus from satellite observations and numerical model simulations

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Moist convective boundary layers are ubiquitous in the Earth's atmosphere. Low level clouds substantially influence the planetary albedo. Therefore, understanding changes in the properties of low level clouds in a future climate is important for understanding global climate change and climate sensitivity. One crucial aspect of the low cloud-climate feedback problem is the transition from stratocumulus to shallow cumulus-topped boundary layers. Unfortunately, the observational understanding of the transition as well as numerical modeling experiments of it are insufficient at present.

In this study, we focus on uncovering key underlying physical processes responsible for the transition from stratocumulus to cumulus topped boundary layers. A combination of satellite observational data obtained from various A-train sensors that include CloudSat and the Atmospheric Infrared Sounder, among others, along with conceptual and dynamical numerical models are used to quantify the physical characteristics of the transition.