

ATS/CIRA Colloquium

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Hosted by Christine Chiu

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ATS 101 and Microsoft Teams

The Complicated Life of Boundary Layer Clouds over the Eastern North Atlantic

The complex boundary layer cloud system over the Eastern North Atlantic (ENA) exerts significant impacts on the global and regional radiation budget. Observed cloudiness over the ENA has been decreasing over the past twenty years consistent with CMIP5 simulations, but the underlying processes associated with these changes involve complicated feedbacks that often blur causality. Boundary layer cloudiness over the ENA undergoes a complicated life cycle that includes a morphological transition from stratocumulus to cumulus in response to rising sea surface temperatures and reduced subsidence, a process often referred to as “deepening-warming”. One of the transitional stages of deepening-warming is a “cumulus-coupled” stage where cumuli coexist with stratocumuli, often organized in clusters that are referred to as marine boundary layer convective complexes (MBLCC). The processes that produce MBLCC over the ENA often occur in association with cold air outbreaks but are not well-understood. In this talk I will review the mechanics of boundary layer clouds and the processes that influence their life cycle, emphasizing cumulus-coupling and development of MBLCC in cold air outbreaks during the summertime over the ENA. A combination of high-resolution Weather Research and Forecasting (WRF) simulations, fifth generation European Centre for Medium Range Weather Forecasting Reanalysis (ERA5), and observations from the US Department of Energy’s ENA Observatory are employed. The talk will also include a perspective on the evolution of cloud structure over the ENA during the past two decades and potential changes in the future.

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