ATS/CIRA Colloquium

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Understanding the ingredients for a global convective hotspot in Subtropical South America: RELAMPAGO-CACTI

Hosted by Peter Jan van Leeuwen

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via Microsoft Teams

Satellite observations and results from field campaigns have elucidated key morphological characteristics and processes in convective storms that produce the majority of global precipitation and hazardous weather. Errors in models' representation of the occurrence, timing, and intensity of these systems leading to local and regional biases in temperature and rainfall in weather and climate models where convective systems, often organized by storm-internal and external processes, are part of the precipitation climate, as well as influence regional and global circulation and composition. In addition, model biases in convection hamper our ability to understand what processes across scales controls critical balances in our earth system, including between radiation and convection, coupling of the surface and the atmosphere, and the extent of influence of anthropogenic influences on clouds and precipitation.

The Remote sensing of Electrification, Lightning, And Mesoscale/microscale Processes with Adaptive Ground Observations (RELAMPAGO) and Clouds, Aerosols, and Complex-Terrain Interactions (CACTI) field campaigns were coupled major field campaigns conducted in Córdoba and Mendoza provinces in Argentina, and western Rio Grande do Sul State in Brazil in 2018-2019 to understand convective lifecycle in a unique geo-climatic convective hotspot. This campaign was motivated by the physical processes and societal impacts of deep convection that frequently initiates in this region, often along the complex terrain of the Sierras de Córdoba and Andes, and often grows rapidly upscale into dangerous storms that impact society. Observed storms during the experiment produced copious hail, intense flash flooding, extreme lightning flash rates, but few tornadoes. The CACTI campaign and the 5 distinct scientific foci of RELAMPAGO: convection initiation, severe weather, upscale growth, hydrometeorology, and lightning and electrification are described, as are the initial scientific results revealing the physical processes relevant to these foci. The campaign's international cooperation, forecasting efforts, and mission planning strategies enabled a successful data collection effort. Leveraging knowledge gained in RELAMPAGO-CACTI, perspectives on improving our understanding and prediction of convective processes and their impacts globally are summarized.

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