

M.S. Defense Announcement

Anindita Chakraborty

June 15, 2023, at 9:00 a.m.

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Thursday, June 15, 2023
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Defense
[CIRA Commons](#) or [Teams](#)

Post Defense Meeting
Riehl Conference Room (211 ACRC)

Committee:
Kristen Rasmussen (Adviser)
Jim Hurrell (Co-adviser)
Brooke Anderson (Environmental and Radiological Health Sciences)

Investigating the Impact of Forced and Internal Climate Variability on Future Convective Storm Environments in Subtropical South America: A Large Ensemble Approach

Subtropical South America (SSA) has some of the most intense deep convection in the world. Large hail and frequent lightning are just two of the hazards that profoundly affect people, agriculture and infrastructure in this region. Therefore, it is important to understand the future convective storm environments over SSA associated with climate change and how these large-scale environmental changes are likely to change high impact weather events in the future. Previous studies have used convection-permitting regional models and radar data to examine convective storm environments in the current climate across different regions of South America. Here, we use a large ensemble of Earth system model simulations to quantify anthropogenically-driven future changes in large-scale convective environments, as well as how those forced changes might be modified by unforced, internal climate variability. Specifically, we examine changes in different thermodynamic parameters of relevance to severe weather events over SSA in austral spring and summer (September-February). We use daily data from a 50-member ensemble from 1870-2100 performed with version two of the Community Earth System Model (CESM2). Results indicate that no forced changes in convective environments are evident until very late in the 20th century. However, increases in convective available potential energy and atmospheric stability, as well as an increase in lower tropospheric vertical wind shear, became apparent around 1990, and these trends are projected to continue throughout the rest of this century. The implication is that future large-scale environments may be favorable for less frequent, but perhaps more intense and severe convective modes and their associated hazards. Results also demonstrate that anthropogenic changes are likely to be significantly modified, regionally, by internal climate variability.