M.S. Defense Announcement
Megan Franke
Tuesday, June 21, at 9:00 a.m.

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June 21, 2022
9:00 a.m.

Defense
ATS Large Classroom (101 ATS) or Teams

Post Defense Meeting
Riehl Conference Room (211 ACRC)

Committee:
James W. Hurrell (Adviser)
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Lantao Sun
Nathaniel Mueller (Ecosystem Science and Sustainability)

Impact of Forced and Internal Climate Variability on Changes in Convective Environments over the Eastern United States

Hazards from convective weather and severe storms pose a serious threat to the continental United States (CONUS). Previous studies have examined how future projected changes in climate might impact the frequency and intensity of severe weather using simulations with both convection-permitting regional models and coarser-grid Earth system models. However, most of these studies have been limited to single representations of the future climate state with little insight into the uncertainty of how the population of convective storms may change. To more thoroughly explore this aspect, we utilize a large-ensemble of climate model simulations to investigate the forced response and how it may be modulated by internal variability. Specifically, we use daily data from 50 climate simulations with the most recent version of the Community Earth System Model to examine changes in the severe weather environment over the eastern CONUS during boreal spring from 1870-2100. Our results indicate that the large-scale convective environment changed little between 1870 and 1990, but from then throughout the 21st century, convective available potential energy increases while 0-6 km vertical wind shear and convective inhibition decreases. While the forced changes in these variables are robust both in space and time, we show that they are likely to be modified significantly by internal climate variability. The time evolution of bivariate distributions of convective indices illustrates that future springtime convective environments over the eastern CONUS will be characterized by relatively less frequent, but deeper and more intense convection. Future convective environments will also be less supportive of the most severe convective modes and their associated hazards.

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