M.S. Defense Announcement
James Larson
Wednesday, November 29, at 10:00 am

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M.S. Defense

November 29, 2023
10:00 am

Defense
ATS Large Classroom (101 ATS) or Teams

Post Defense Meeting
Riehl Conference Room (211 ACRC)

Committee:
James Hurrell (Advisor)
David Thompson (Co-advisor)
Megan Willis (Chemistry)

The Influence of Western Boundary Currents on Tropospheric Climate Variability in Reanalyses and Climate Models

Oceanic western boundary currents play a crucial role in transporting heat poleward, thereby influencing the midlatitude climatological-mean climate and serving as an important component for midlatitude storm tracks that provide rainfall to land regions. Yet, what is still left to be determined is what role these oceanic currents play in influencing atmospheric variability. Characterized by the presence of mesoscale features such as oceanic eddies and sharp sea surface temperature (SST) gradients, the western boundary currents define a uniquely separate regime for air-sea interactions on climatic timescales relative to the rest of the ocean basins. Yet, the standard resolution of most climate models, with grid cells ranging from 100-250 kilometers, fail to capture these mesoscale features, which typically span 10-50 kilometers. In this study, simple but robust observational and modeling evidence is provided which shows that variability in the SST field over the western boundary currents has a demonstrable influence on tropospheric climate variability. The findings reveal that SST anomalies in these currents co-vary with precipitation and vertical motion, with measurable influence extending into the upper troposphere. It is demonstrated that sharpening the horizontal resolution in both a climate model and in a reanalysis alters the spatial patterns both of sea surface temperature and of regional atmospheric processes. Given the significant influence of these western boundary currents on the broader regions surrounding them, climate projections conducted with grid cells coarser than 50 kilometers may overlook crucial processes.