MMM SEMINAR SERIES

Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective

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Mesoscale convective systems (MCSs) are the dominant rainfall producer in the U.S. during the warm season, causing natural disasters and severe weather every year. Global climate models have large uncertainty in projecting precipitation changes in the future climate. Here we developed a simple Lagrangian parcel model (includes single- and multi-column models) to investigate the impact of global warming on MCS initiation and growth. The single-column parcel model projects a mean precipitation decrease over the central U.S. and an increase to its east, in agreement with the CMIP5 model projection. It also highlights the crucial role of current climate mean state model bias in influencing future mean precipitation projection. As for convective population, the model captures the decreased occurrence frequency of weak to moderate convection and increased frequency of strong convection due to the increased CAPE and CIN, in agreement with convection-permitting regional simulations. The multi-column parcel model captures readily the cold pool-induced upscale growth feature. It simulates smaller mesoscale clusters over the central U.S. under global warming due to gust front slowdown and subsidence strength enhancement. The model should be a useful tool for investigating the impact of global warming on MCS at mid-latitudes and providing useful guidelines to improve GCM simulations.

Qiu Yang*, L. Ruby Leung, Zhe Feng, Fengfei Song, Xingchao Chen, 2021: A Simple Lagrangian Parcel Model for the Initiation of Summer-time MCSs over the Central US, Journal of the Atmospheric Sciences, 78(11), 3537-3558, https://doi.org/10.1175/JAS-D-21-0136.1

Qiu Yang*, L. Ruby Leung, Zhe Feng, Xingchao Chen, 2023: Impact of Global Warming on U.S. Summertime Mesoscale Convective Systems: A Simple Lagrangian Parcel Model Perspective. Journal of Climate, https://doi.org/10.1175/JCLI-D-22-0291.1

Thursday, 20 April 2023, 2:00pm

Refreshments 1:45pm

Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane
FL2-1022, Large Auditorium

Seminar will also be live webcast

https://operations.ucar.edu/live-mmm

Participants may ask questions during the seminar via Slido