Anvil Clouds of Mesoscale Convective Systems and Their Effects on the Radiative Heating Structure

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Introduction

Mesoscale convective systems (MCSs) are objectively identified (Yuan and Houze 2010a). Active MCSs are further divided into two types: separated MCS (SMCS) and connected MCS (CMCS). Combining three types of A-Train data (MODIS, AMSR-E and CloudSat) allows us not only to identify MCSs but also to separate their non-raining anvils from their raining regions. Hence, we are able to have quantitative global maps of anvil coverage and the global impact of MCS diabatic heating structure can be more comprehensively investigated.

Conclusions and Summary

- Anvil distributions suggest MCSs objectively identified are consistent with prior knowledge & previous work.
- By separating anvil portions of active MCSs from their raining regions. The quantitative global map of MCS anvil coverage can then be obtained.
- Larger systems dominate anvil cloud distributions.
- Anvil clouds likely result in net radiative heating/cooling in the middle/upper troposphere which modulates the total diabatic heating structure associated with MCSs.

Future work

Understanding the effects of more comprehensive diabatic heating of MCSs on the structure of mean large-scale circulation.

Annual Mean Coverage of MCS Anvil Clouds and Their Radiative Effects

- Anvil clouds from active MCSs concentrate in tropical deep convective regions.
- Anvil clouds associated with active MCSs result in strong net radiative heating/cooling in the middle/upper troposphere over regions where anvil clouds occur frequently.
- Anvil cloud radiative heating adds more variability in the vertical structure of the MCS diabatic heating profile.

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