Comparison of Mesoscale Convective Systems During DYNAMO

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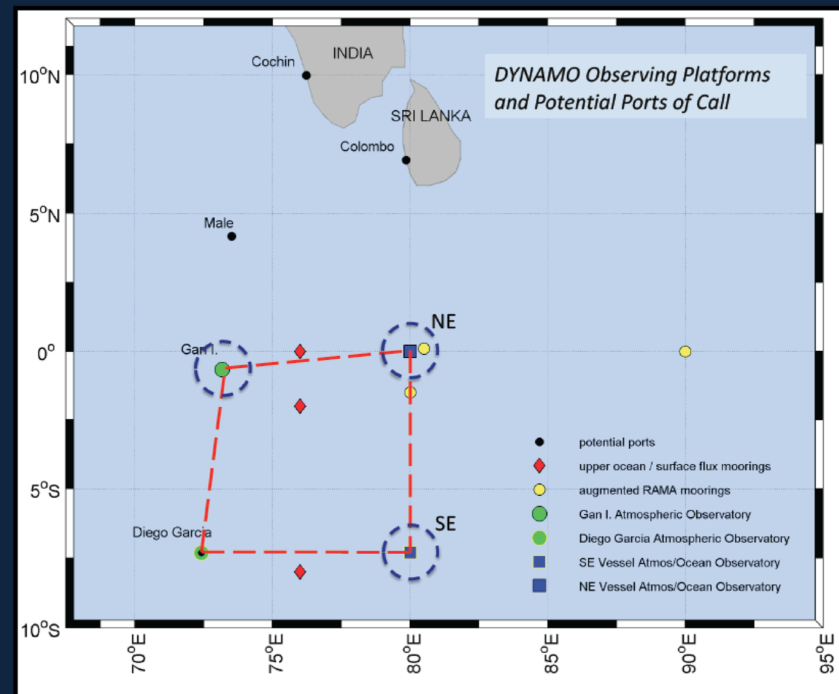
INTRODUCTION TO DYNAMO

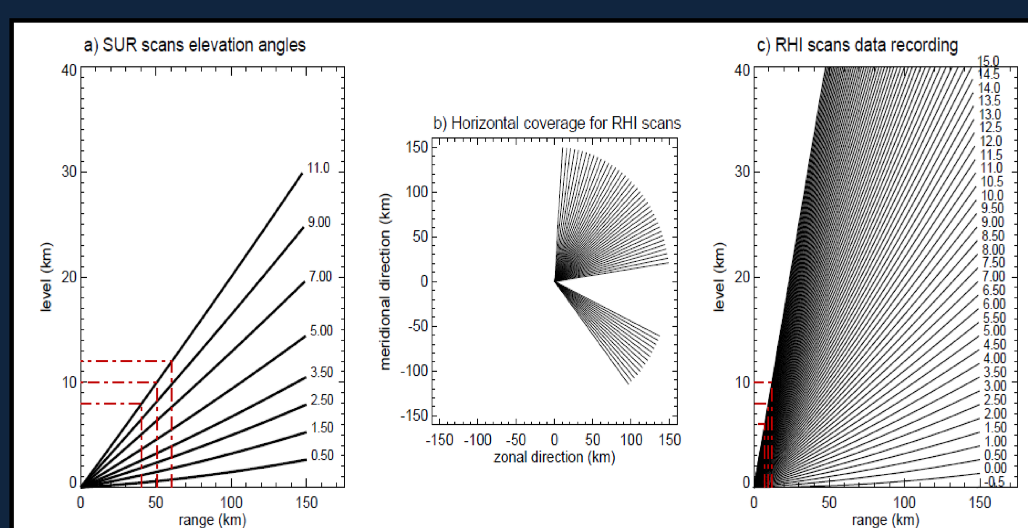
The goal of the DYNAmics of the MJO (DYNAMO) experiment (Oct 2011 – March 2012) was to improve simulation and prediction of the Madden-Julian Oscillation (MJO) by understanding the coupling between convection and the large-scale environment over the Indian Ocean. Instrument platforms included an extensive sounding array, air-sea measurements, research aircraft, and a radar network.



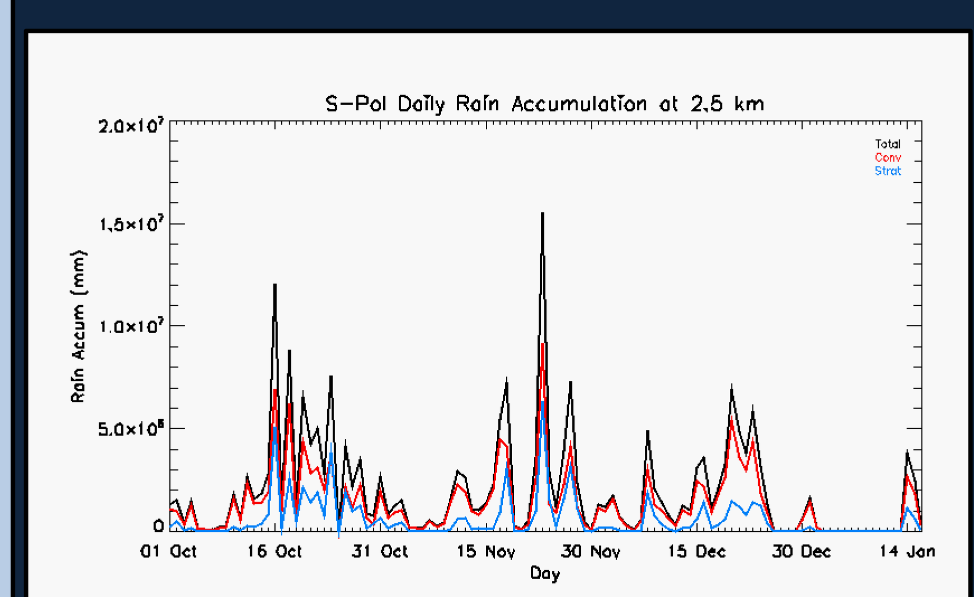
The radar network consisted of C- and W-band radars on each research vessel, and a radar "supersite" on Gan Island, including Ka- and W-band radars at the AMF2 site, a C-band radar (SMART-R), and an S-band (S-PolKa). The objective of the radar network was to fully characterize the ensemble of convection associated with each stage of MJO initiation. A variety of wavelengths were used to observe the entire cloud spectrum, and scanning strategies were designed to obtain statistics of the cloud population.

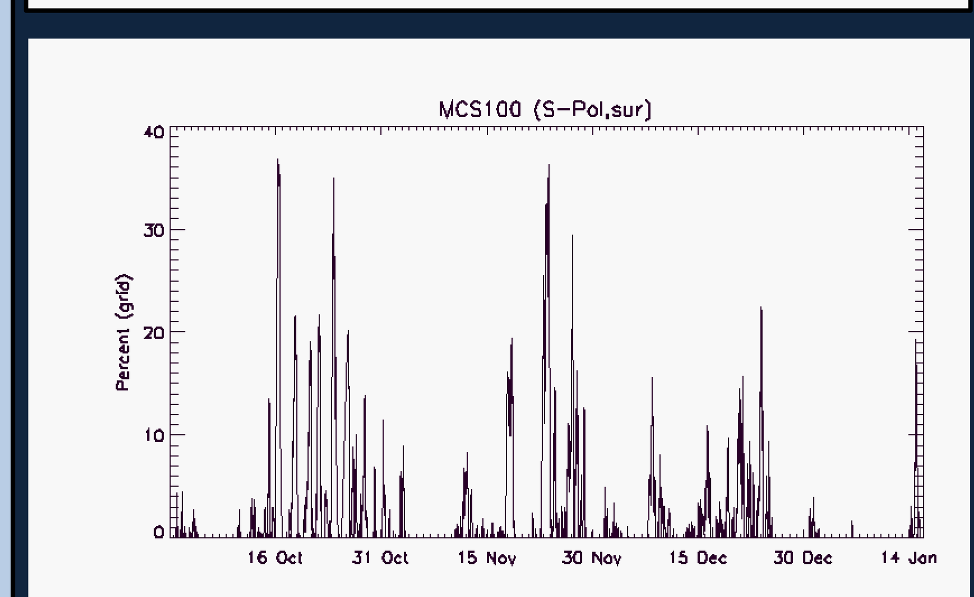
Goals of S-band:

- Observe the convective population and transition from shallow to deep (MCSs)
- Provide details on airflow within the storm
- Provide highly resolved hydrometeors information
- Provide high-quality precipitation estimates



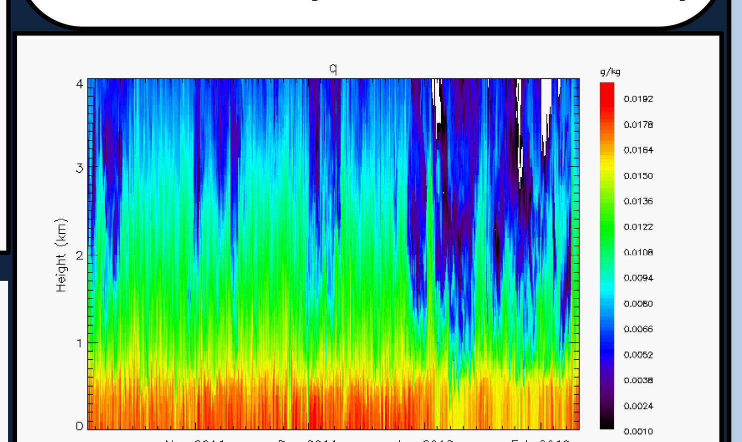
CASE SELECTION

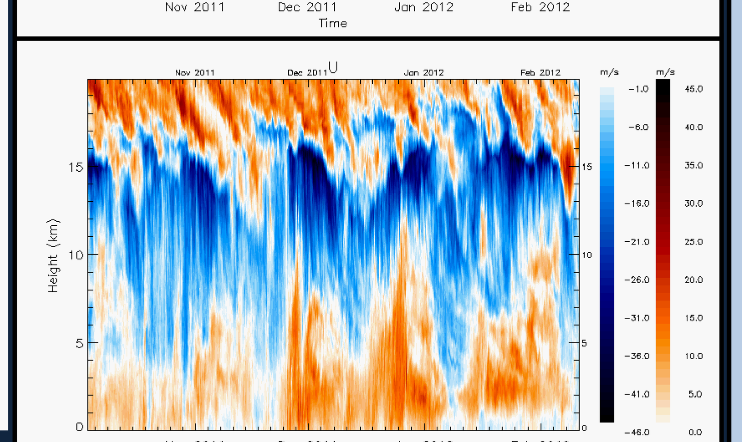




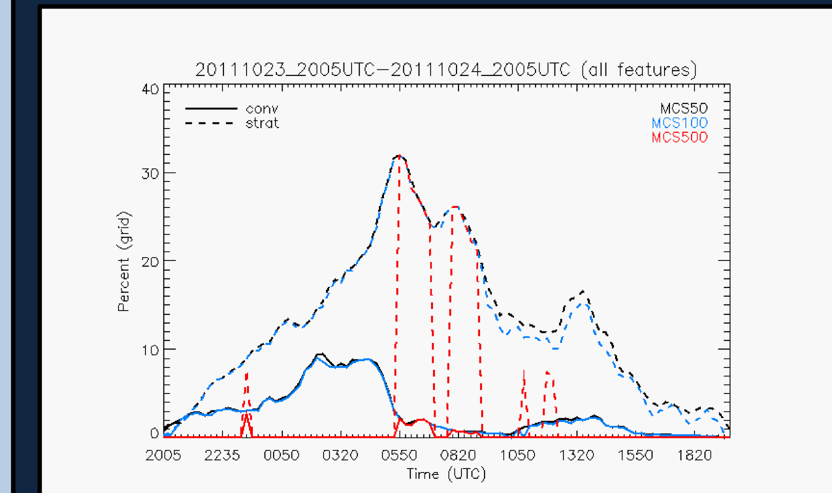
Increased rainfall and MCS activity during active MJO phases (late Oct., Nov., and Dec.) coinciding with periods of deep-layer moisture

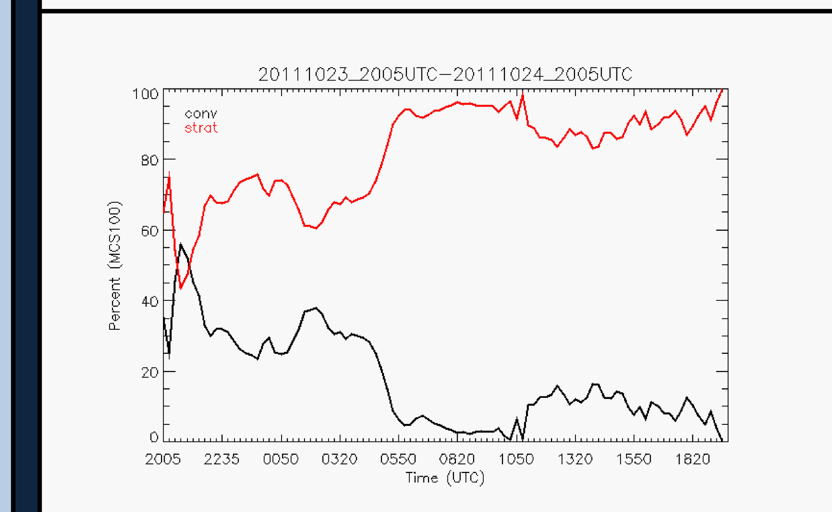
One case from October, one from December (active periods characterized by different wind shear)

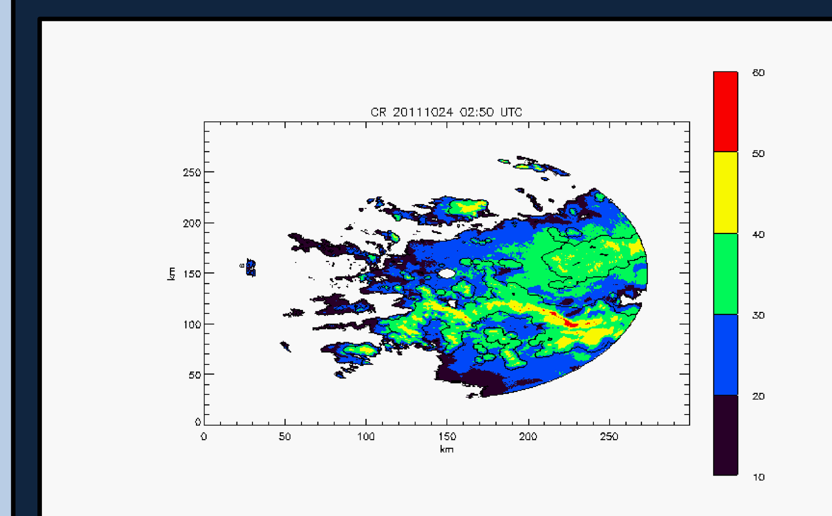




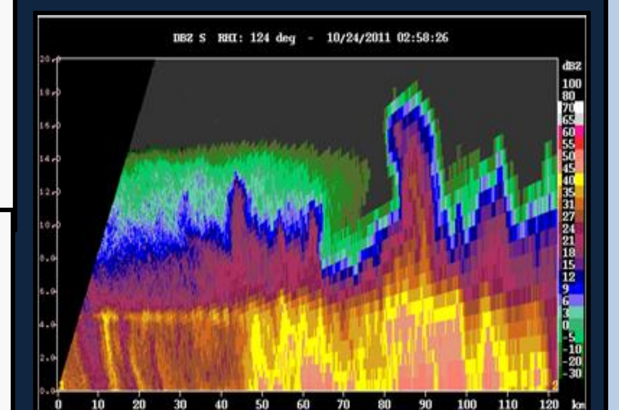
OCTOBER 23-24

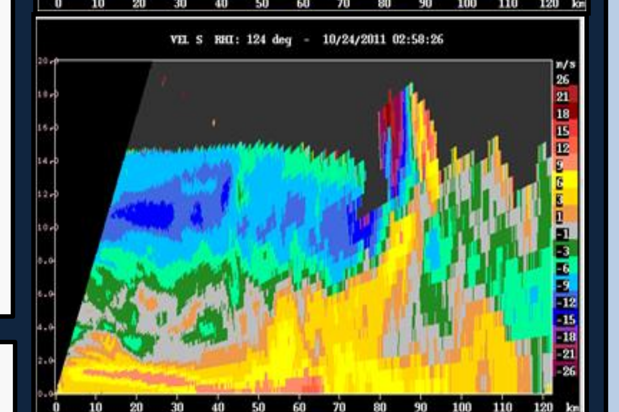


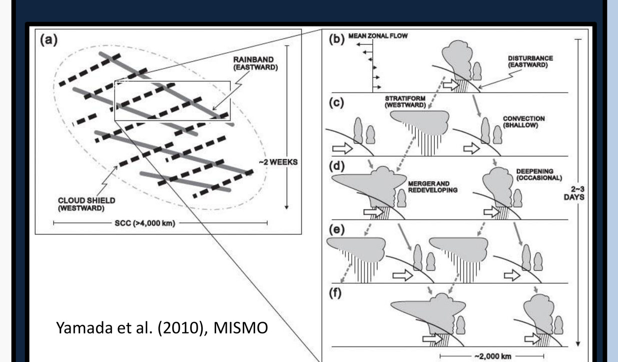




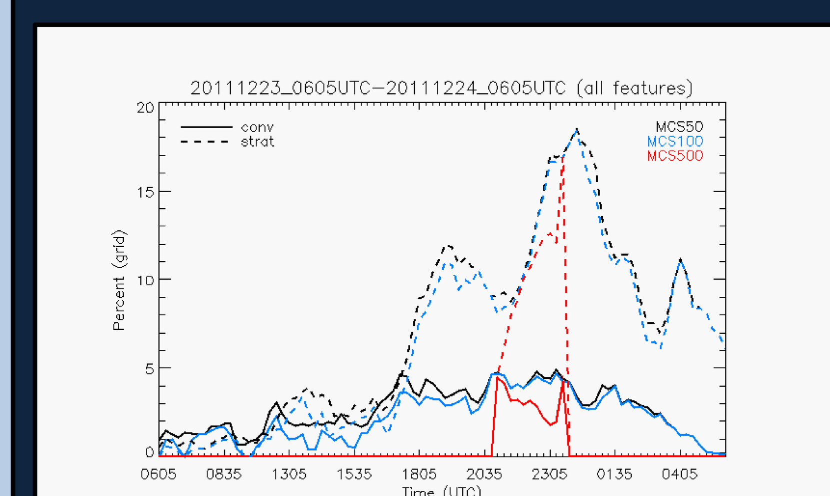
Widespread stratiform with embedded convection in environment with weak low-level westerlies changing to easterlies aloft

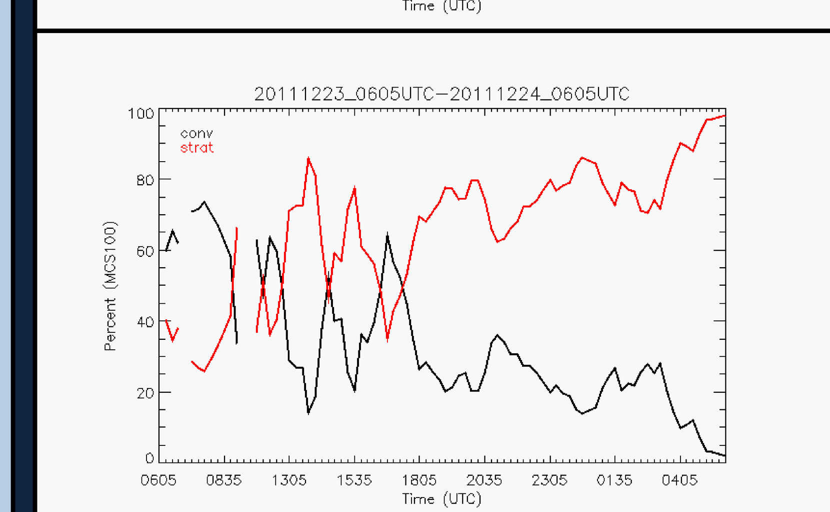


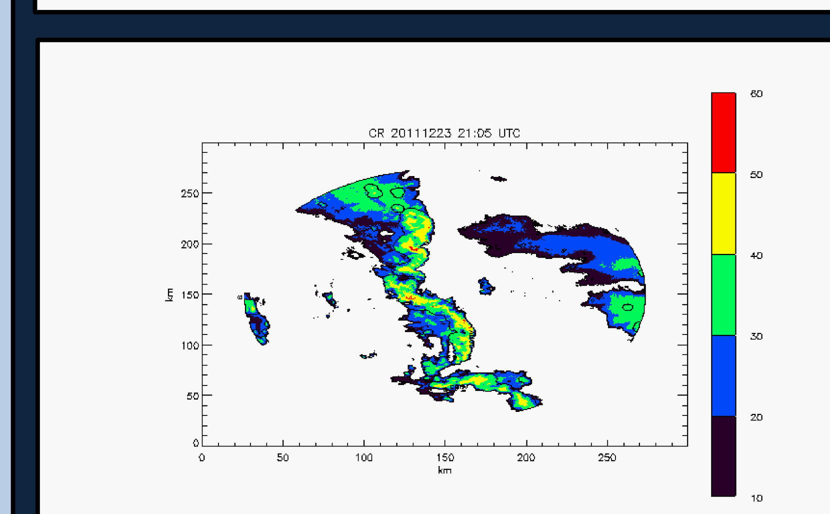




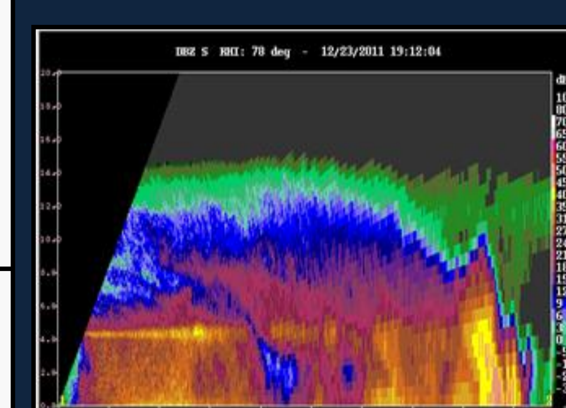
DECEMBER 23-24

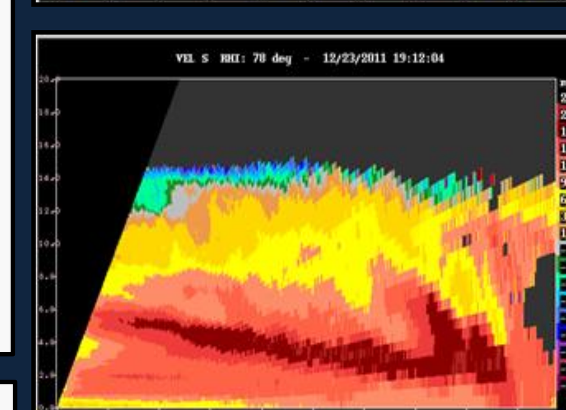


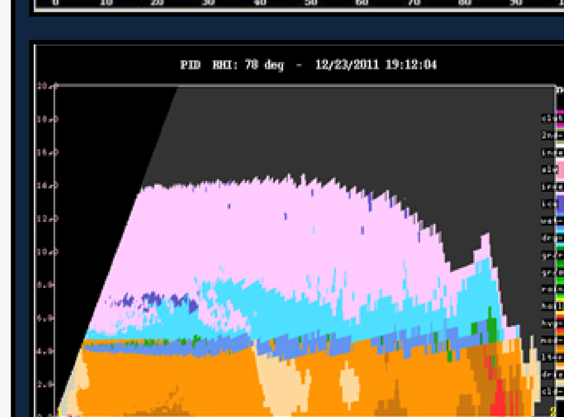




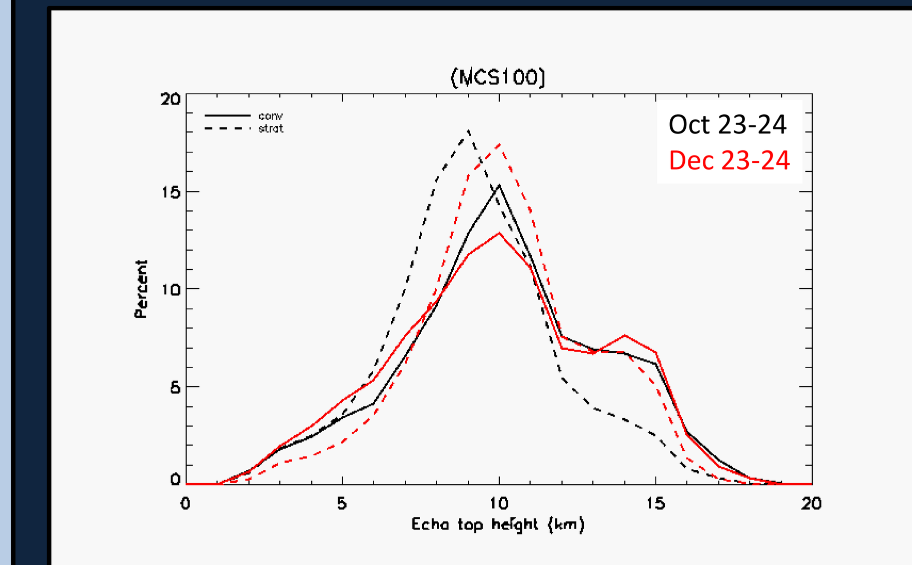
Several squall-line-type features lower stratiform fraction and increased, deeper westerlies

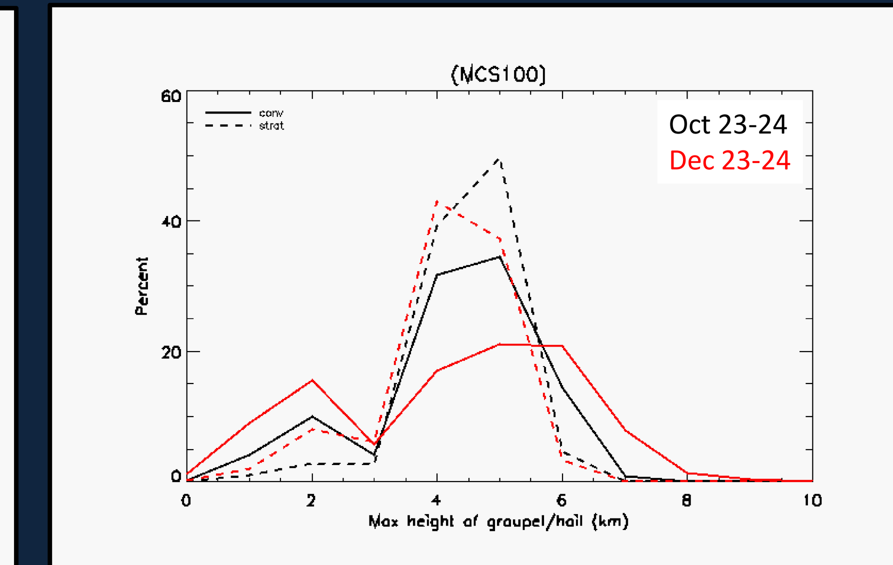


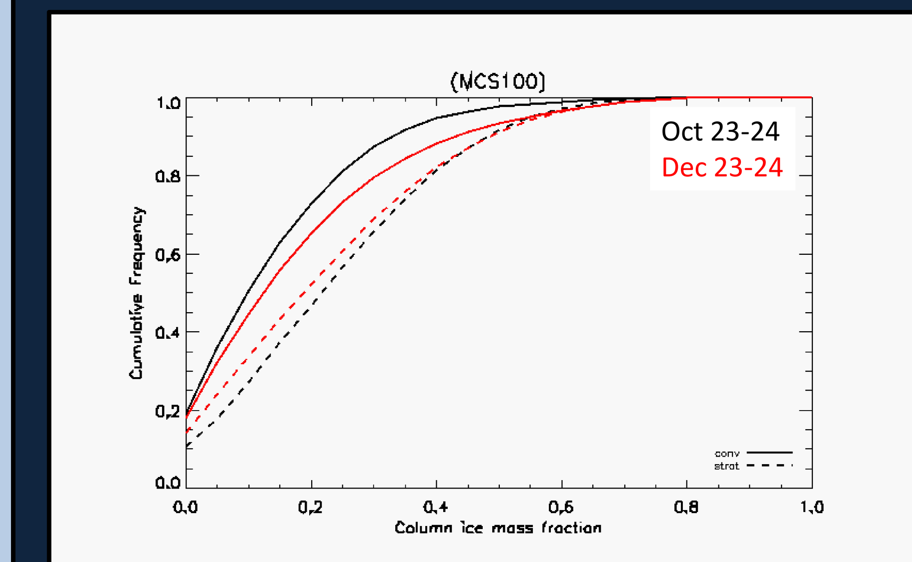


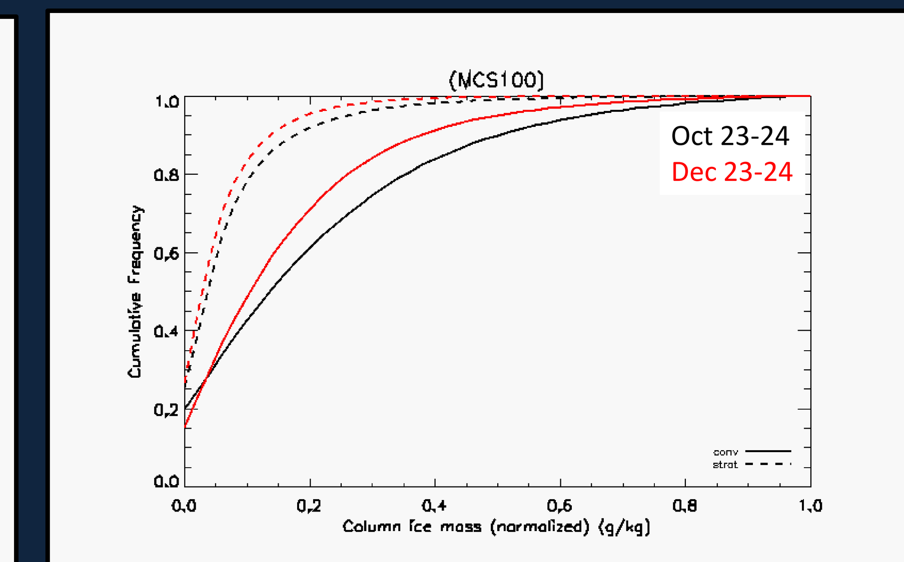


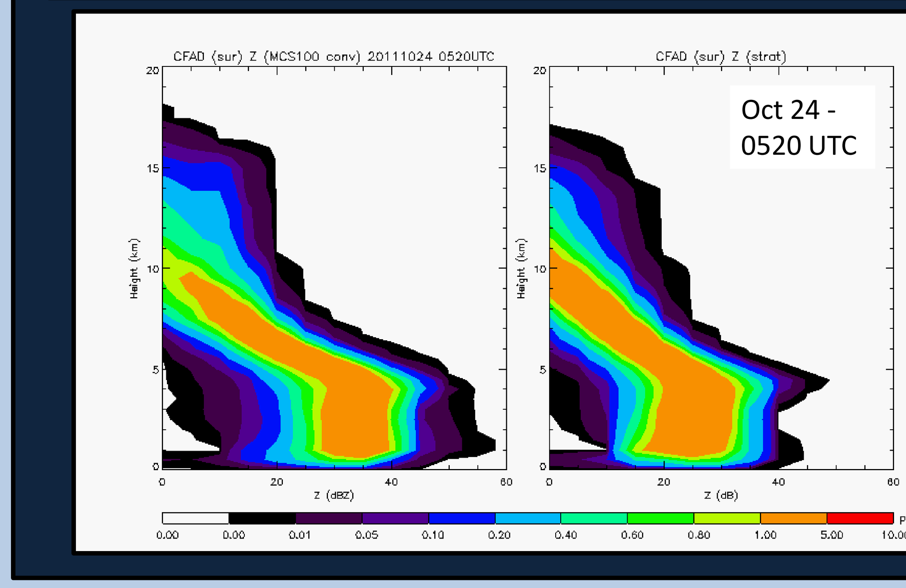
COMPARISON

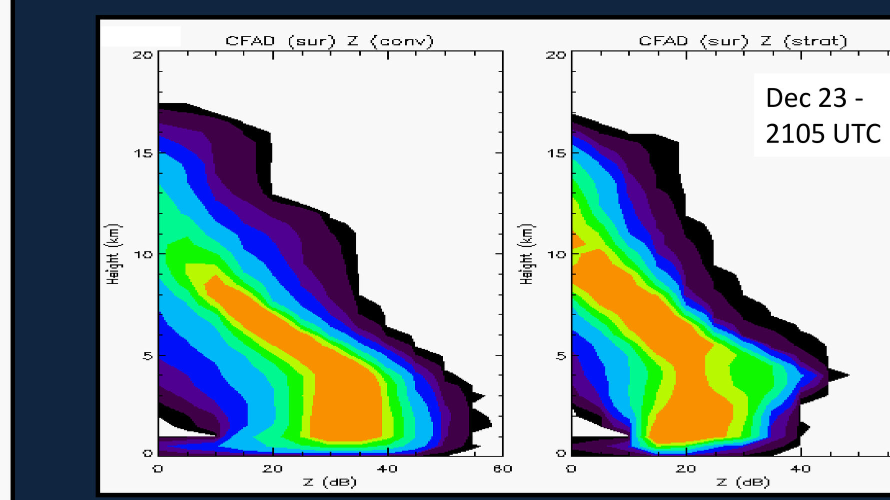












SUMMARY/FUTURE WORK

-Bimodal distributions in echo-top height with broader distributions in Dec, shallower stratiform echo for Oct case, but deeper convection

-Greater column ice mass fraction for stratiform (Oct case), while convection in MCSs during the Dec case had greater fractions

-Greater column ice mass for convection (precipitation-sized ice), especially for Oct case, with greater ice mass in stratiform for Oct compared to Dec case (decaying convection)

-Greater heights with graupel/hail in convection during Dec case, with greater heights in stratiform for Oct (decaying convection)

***Analyze additional cases and relate to environment**

*** Describe evolution from non-precipitating to precipitating convection**

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