

The Representativeness of ARM Cloud Measurements: Initial Comparison of ARM Cloud Statistics With Cloudsat and CALIPSO Statistics

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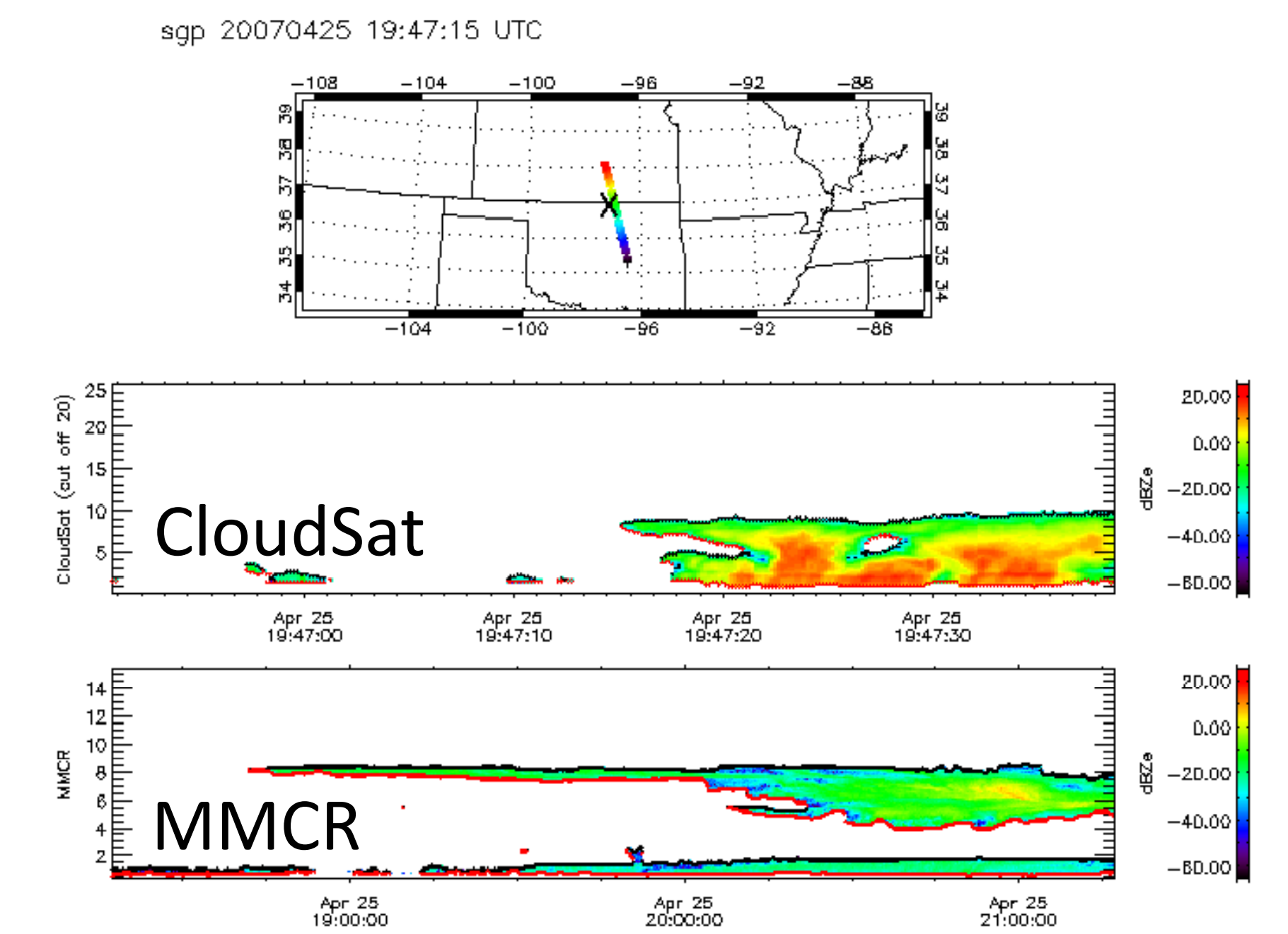
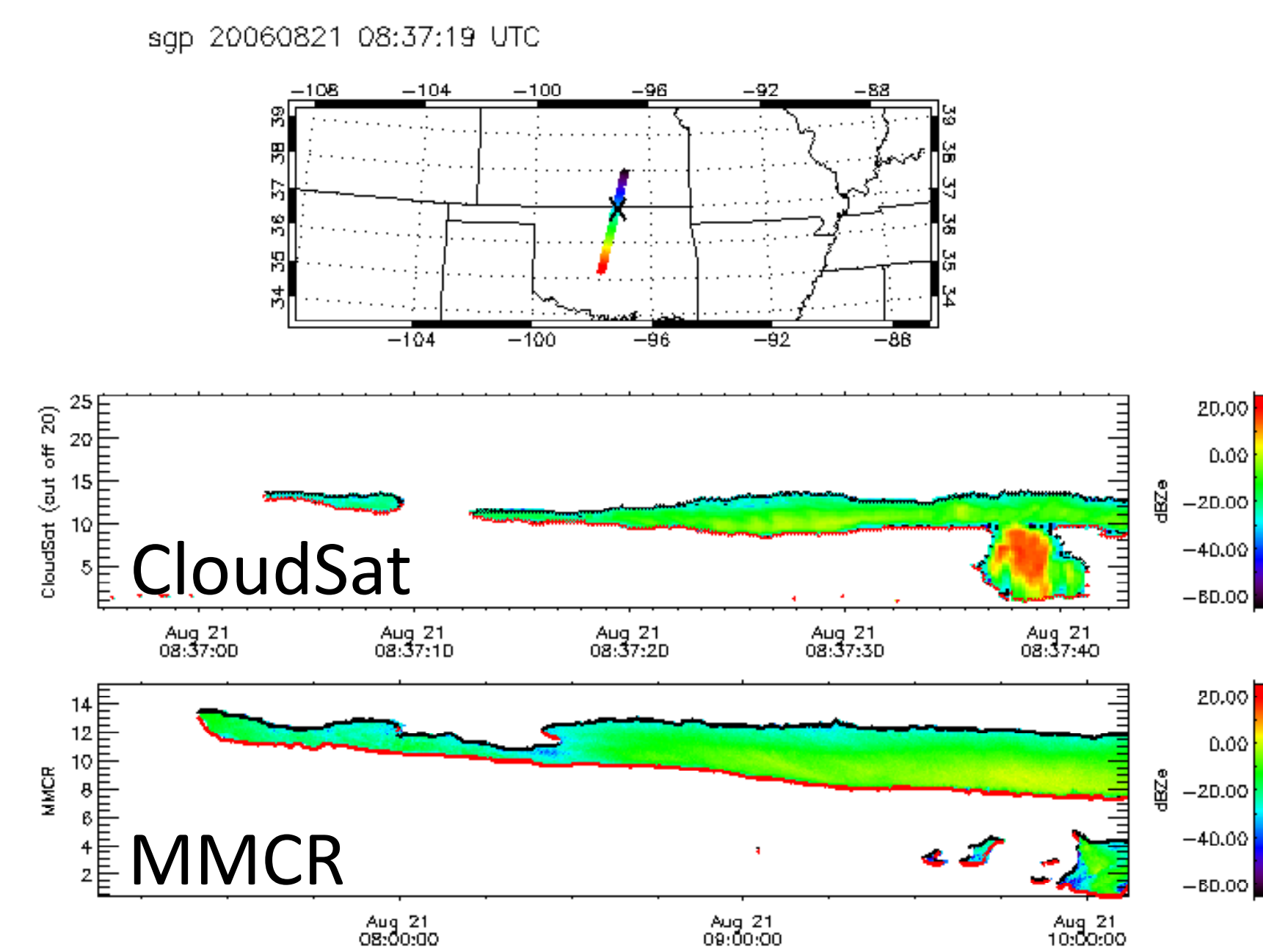
Contributions from: Roger Marchand (Cloudsat mask), Mark Vaughn (CALIPSO Mask), Eugene Clothiaux (MMCR mask)

The Hypothesis: Over some time interval, data from the fixed ground sites approximate the actual regional cloud statistics as atmospheric features pass over the instruments. The A-Train hypothesis is similar to ARM except that the regional cloud statistics are approximated from many instantaneous vertical curtains of data collected as the satellites pass along fixed ground tracks.

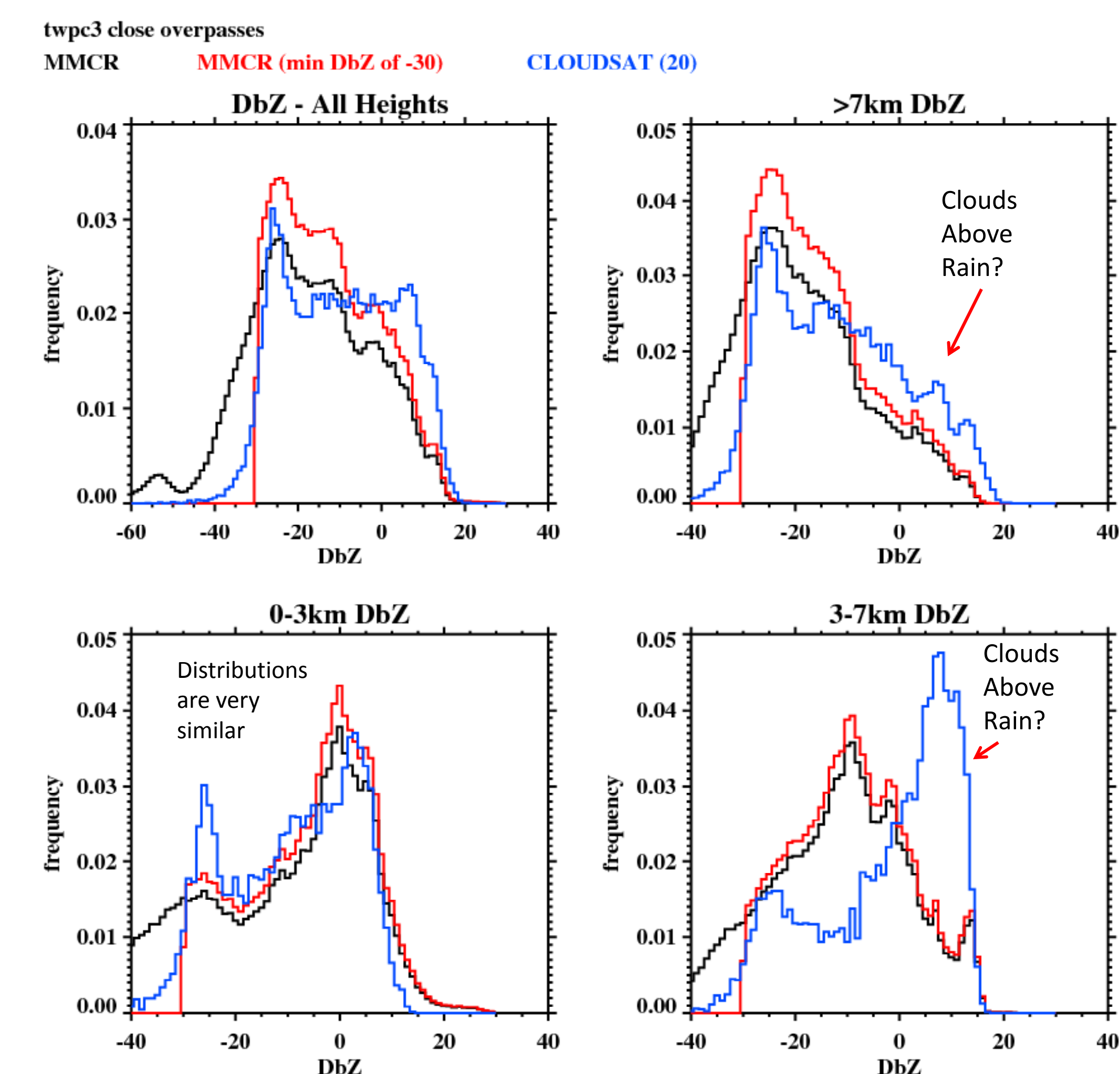
The Challenge: On the left we find a case where the cloudsat (spatial) and MMCR (temporal) measurements look similar. On the right, the cloud fields are very different. How do the statistics in reflectivity and hydrometeor occurrence compare over time and in space?

Findings:

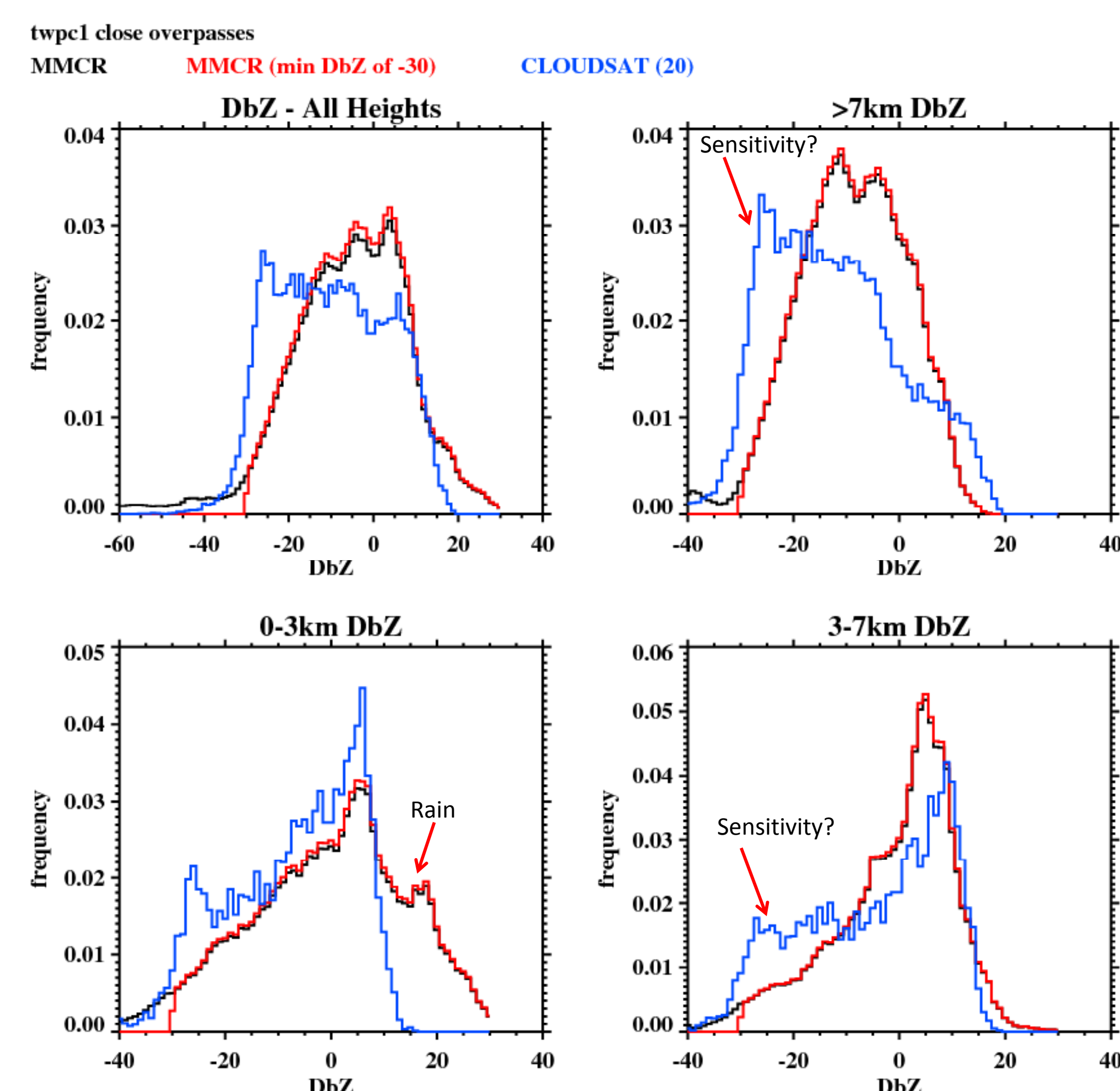
- 1) Strong similarities are noticed in dBZ Statistics in the lower levels. Significant differences in dBZ statistics are found at SGP in the middle and upper levels. The Manus MMCR appears to be less sensitive than Cloudsat.
- 2) Much longer temporal averages of ARM data beyond the seasonal periods examined here are required to achieve stable statistics as compared to Cloudsat.



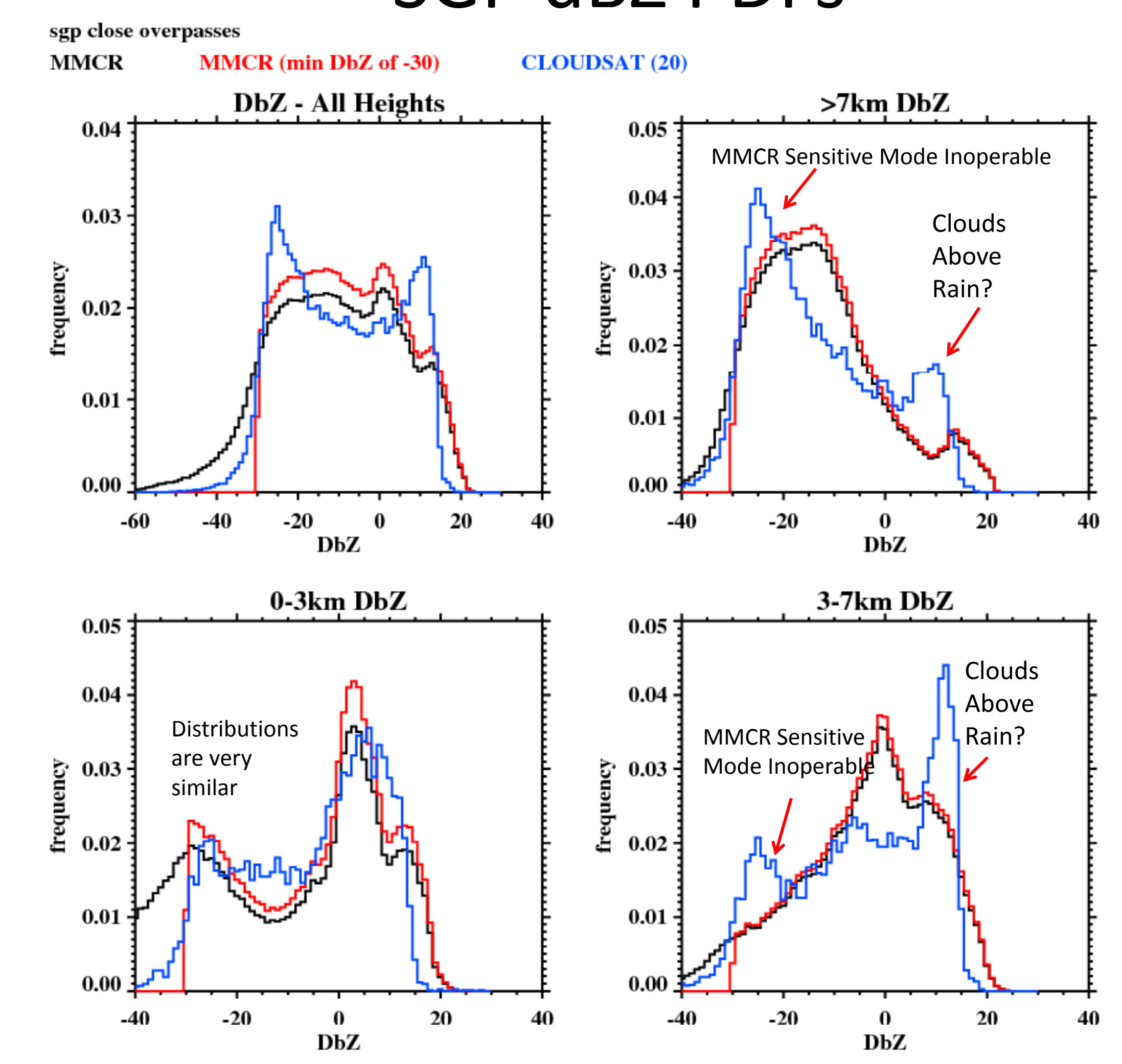
Darwin dBZ PDFs



Manus dBZ PDFs

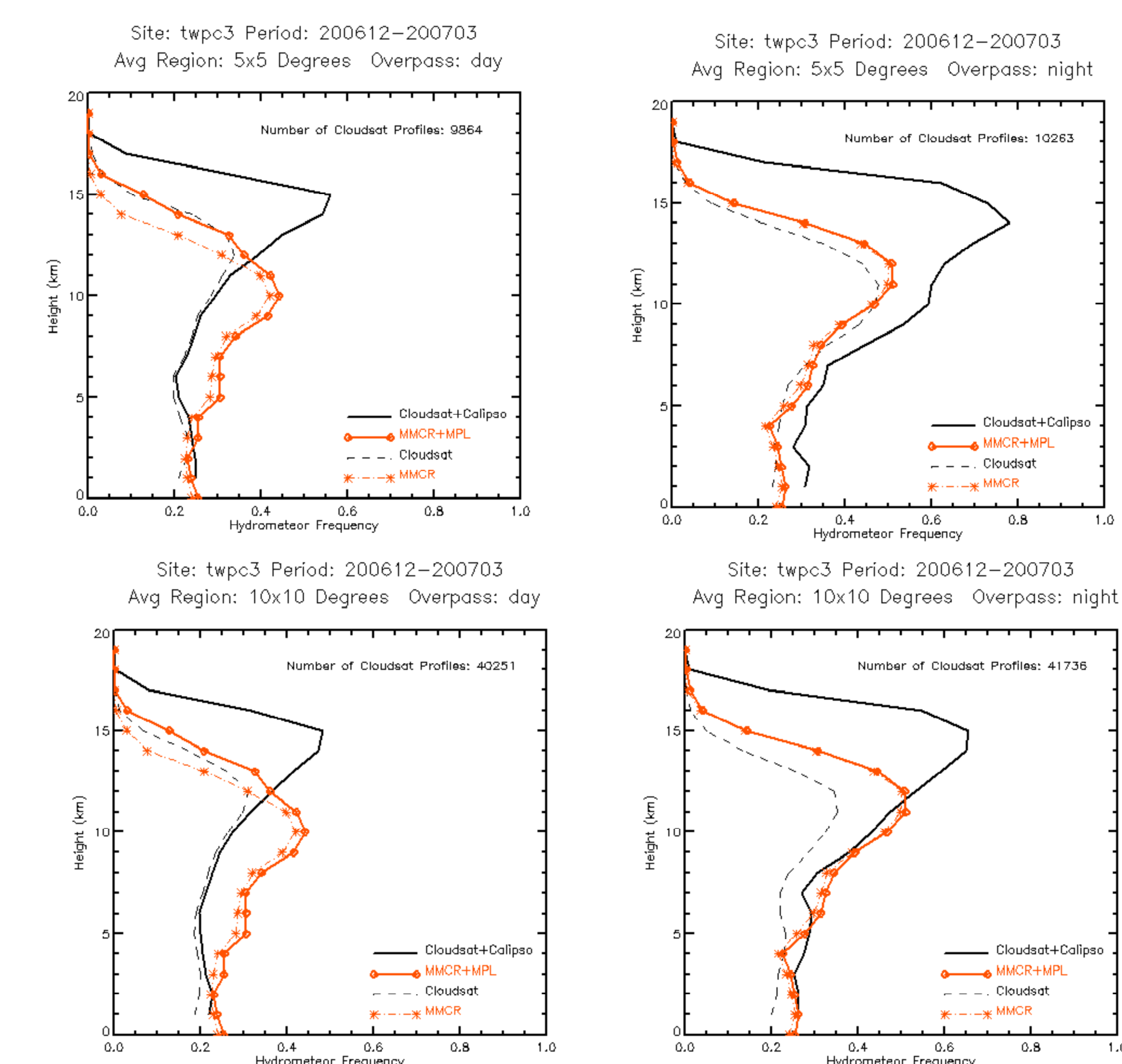


SGP dBZ PDFs

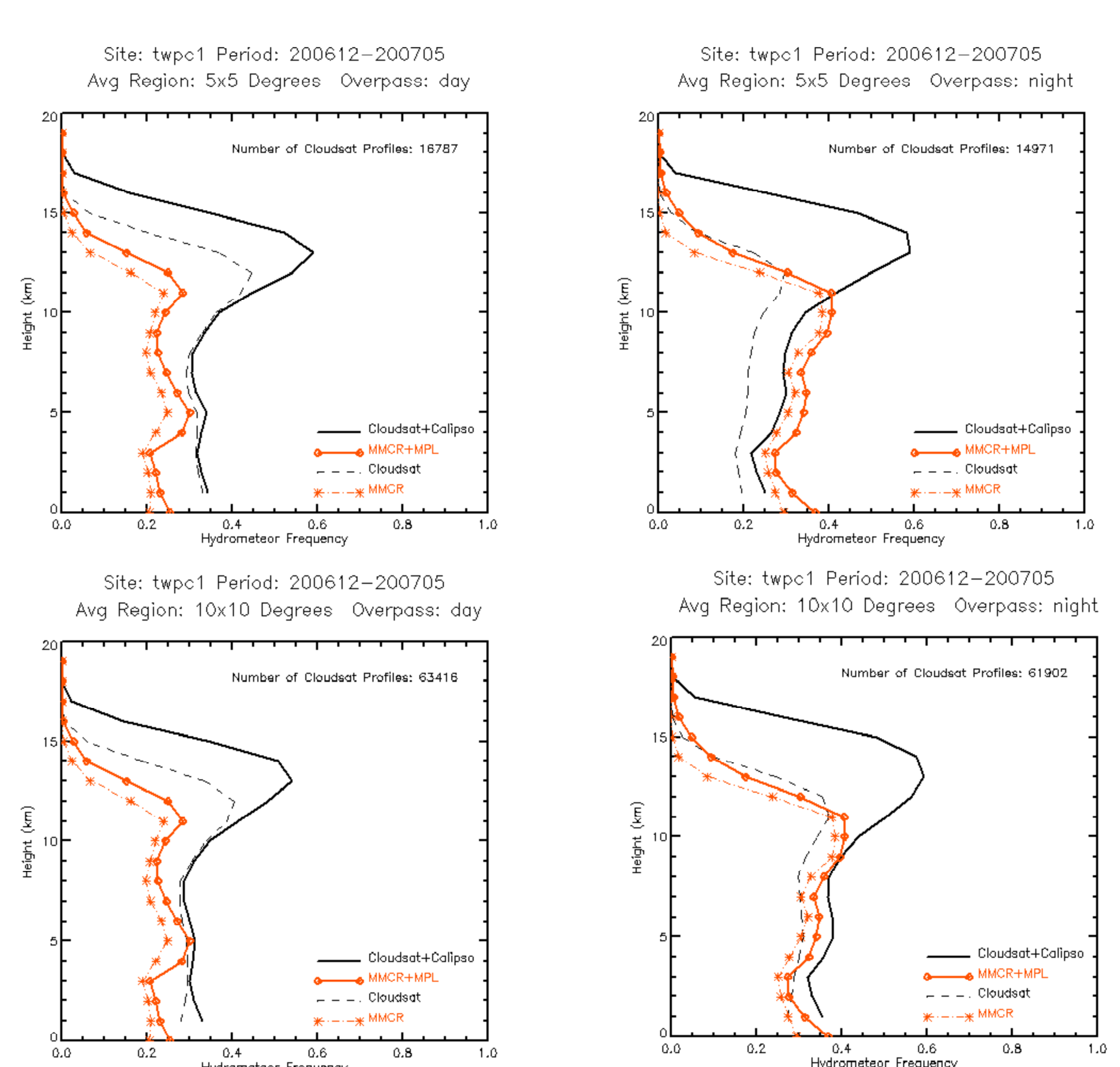


- Above are shown DbZ PDF's at Darwin (left, 200601-200608, 200612-200709), Manus (middle, 200612-200705) and SGP (right, 200606-200708). Cloudsat – Blue, MMCR (Black), MMCR with -30 dBZ cutoff (red). We used the 50 cloudsat profiles centered on the closest profile to MMCR and 60 minutes centered on the overpass time for the MMCR.
- Below are shown vertical hydrometeor frequencies using Cloudsat and Calipso in 5x5 and 10x10 degree averaging regions compared to 2-hour MMCR and MPL averages centered on the overpass times.

Darwin Vertical Frequency



Manus Vertical Frequency



SGP Vertical Frequency

