NAST-I/M, MAMS Cloud Clearing

William J. Blackwell and David H. Staelin
MIT Research Laboratory of Electronics

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Outline:

1. **Instrument descriptions**
2. **Construction of CAMEX-3 radiance database**
3. **Clouds: Simulation vs. CAMEX-3**
4. **Summary / Conclusion**

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Instrument Summaries

NAST-I

1. 8500-channel infrared spectrometer covering 3.7 - 15.5 μm wavelengths
2. 2.5-km spatial resolution at nadir
3. ±45° (40-km) swath width

NAST-M

1. 16-channel microwave spectrometer covering 50-57 and 114.75-122.75 GHz bands.
2. 2.5-km spatial resolution at nadir
3. ±65° (100-km) swath width

MAMS

1. 12-channel visible/IR imager
2. 50-m spatial resolution at nadir
3. 37-km swath width

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CAMEX-3

1. August / September 1998
2. Southeastern U.S. / Atlantic
3. Wide variety of clouds overflown
4. Over 50 hours of data (all instruments operating)

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MAMS Cloud Detection Algorithm

1. 12.4 μm channel used (if unavailable, 11.2 μm used)
2. Group MAMS pixels that fall within each NAST-I/M pixel (~3000)
3. Compare standard deviation of MAMS T_B with threshold (~0.3 K)
4. Compare mean of MAMS T_B to "local" clear-air MAMS T_B mean

For each NAST-I/M pixel, we compute:

1. Fraction of cloudy (at least 1.5 K colder than local clear-air) MAMS pixels
2. Cloud moment (mean pixel temperature perturbation)

Note: Only scan angles less than 15 degrees are used

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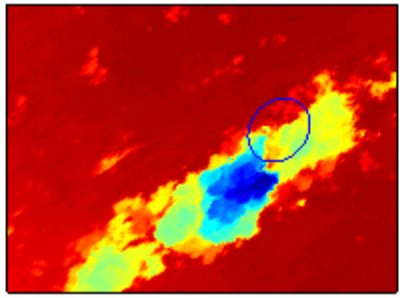
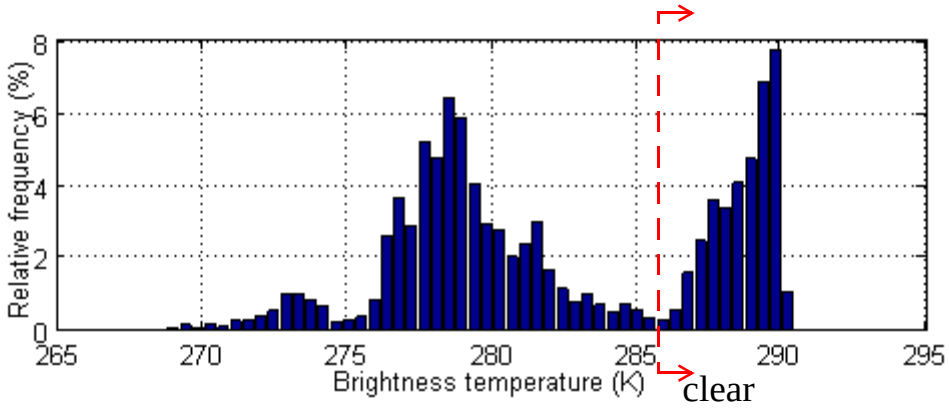
Histogram of MAMS pixels within NAST-I/M pixel





- Cloud fraction readily determined

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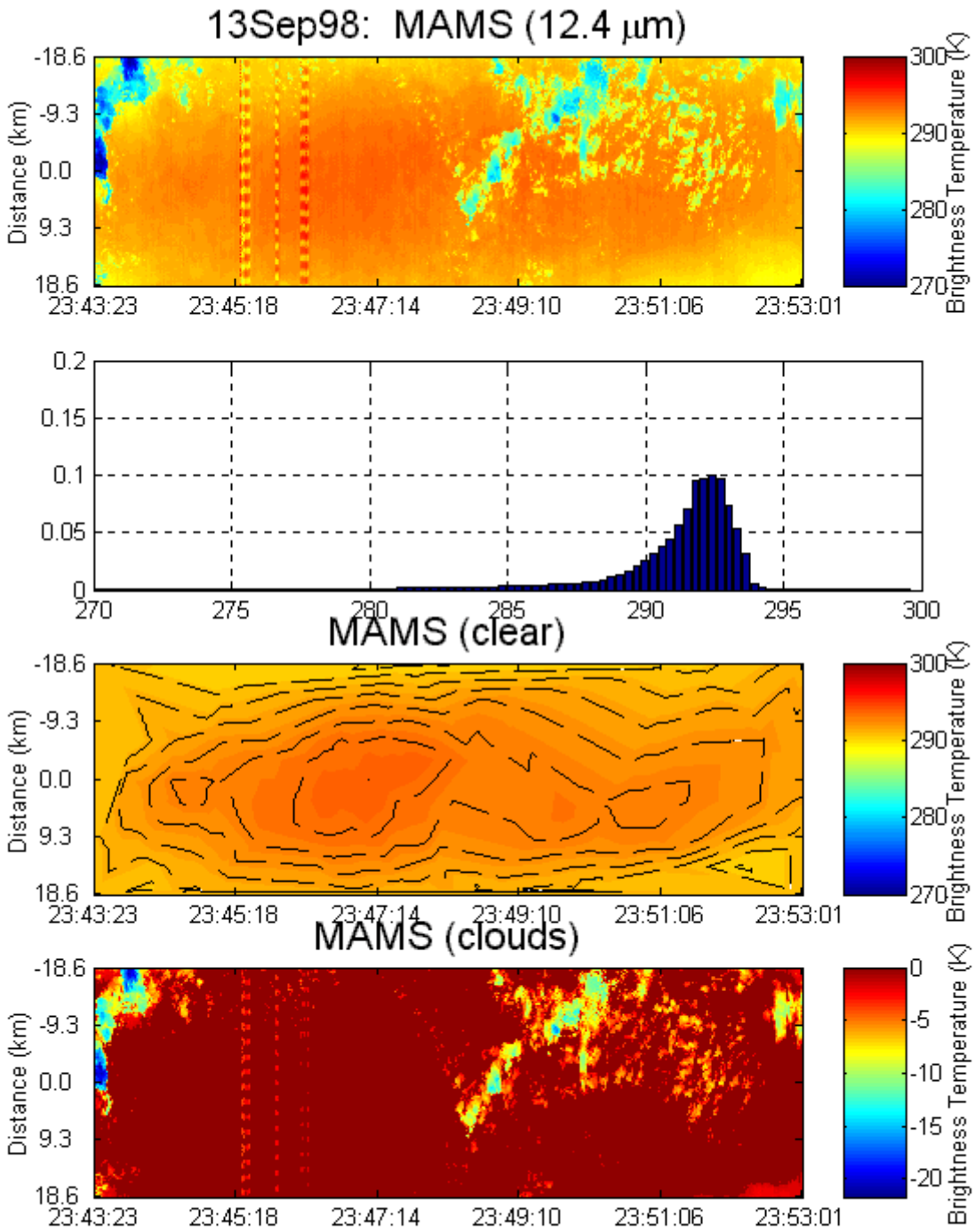

Clear air and clouds generally separable

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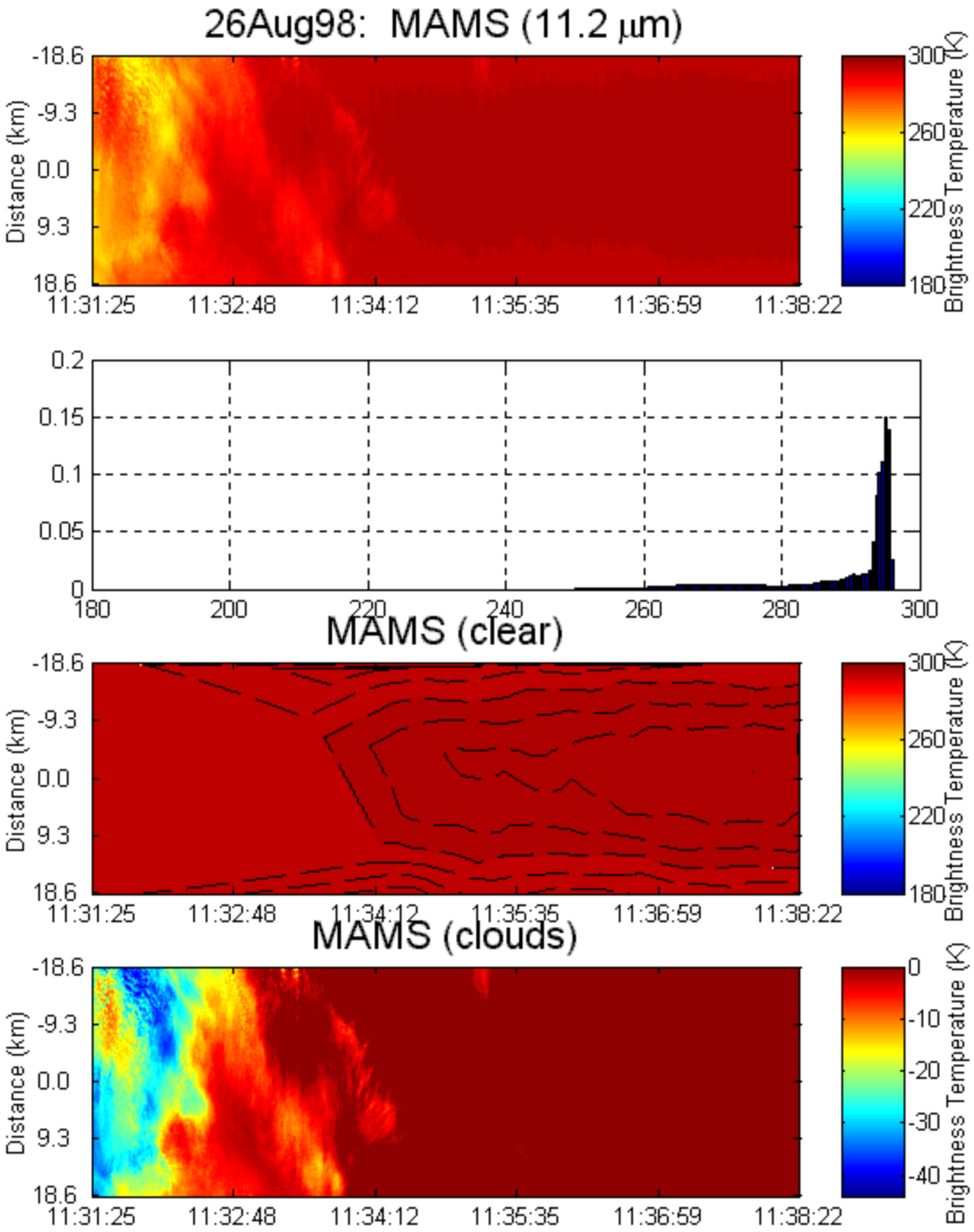

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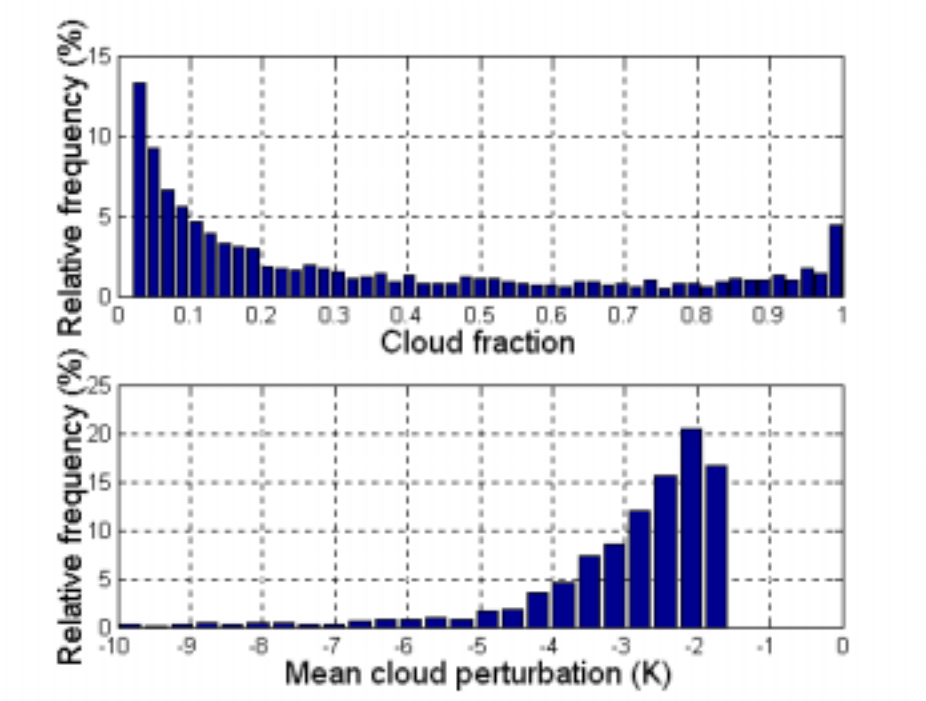
Statistics of MAMS-Derived Cloud Database



- Wide range of cloud conditions represented in database

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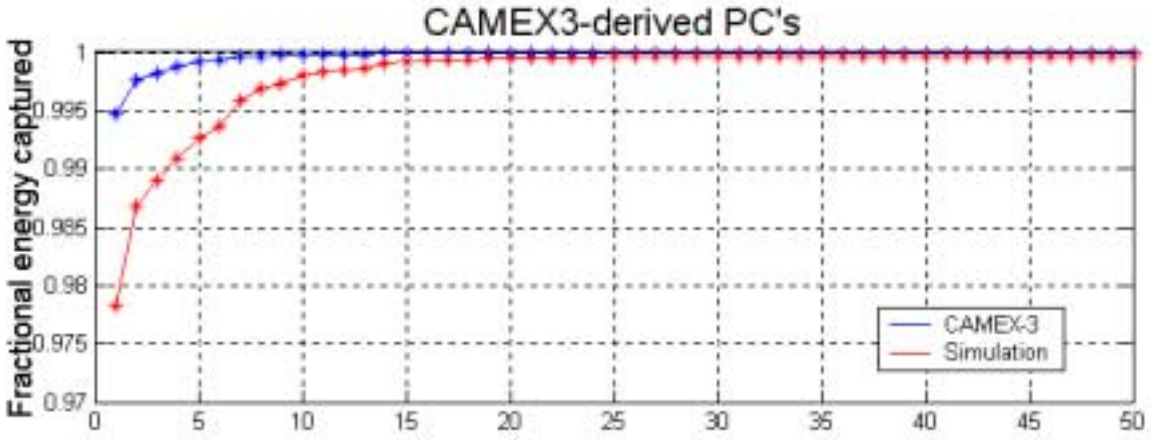
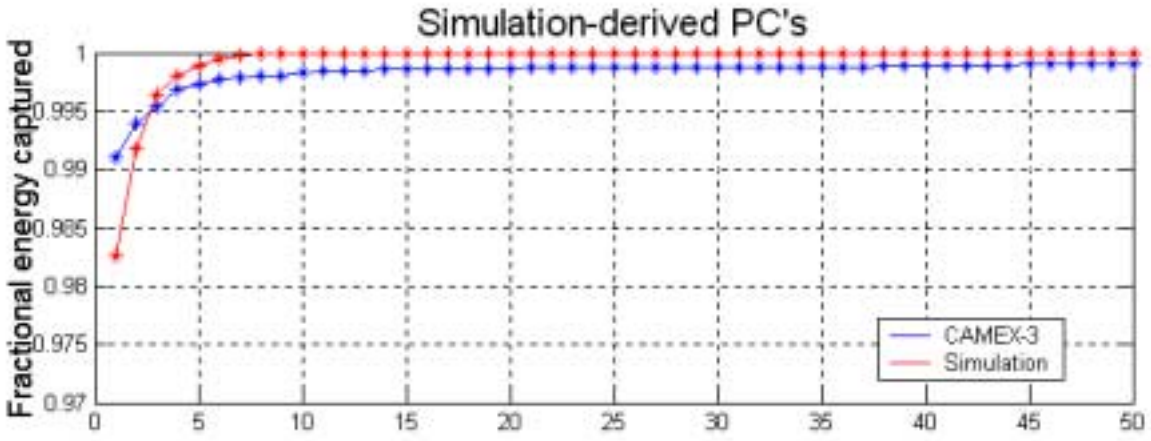
Simulation vs. CAMEX-3: Temperature Band PC's





- Simulation PC's omit some observed degrees of freedom (DOF)
- Observed PC's (~20 PC's) capture most simulation variance
- CAMEX-3 data has few DOF in T(h)

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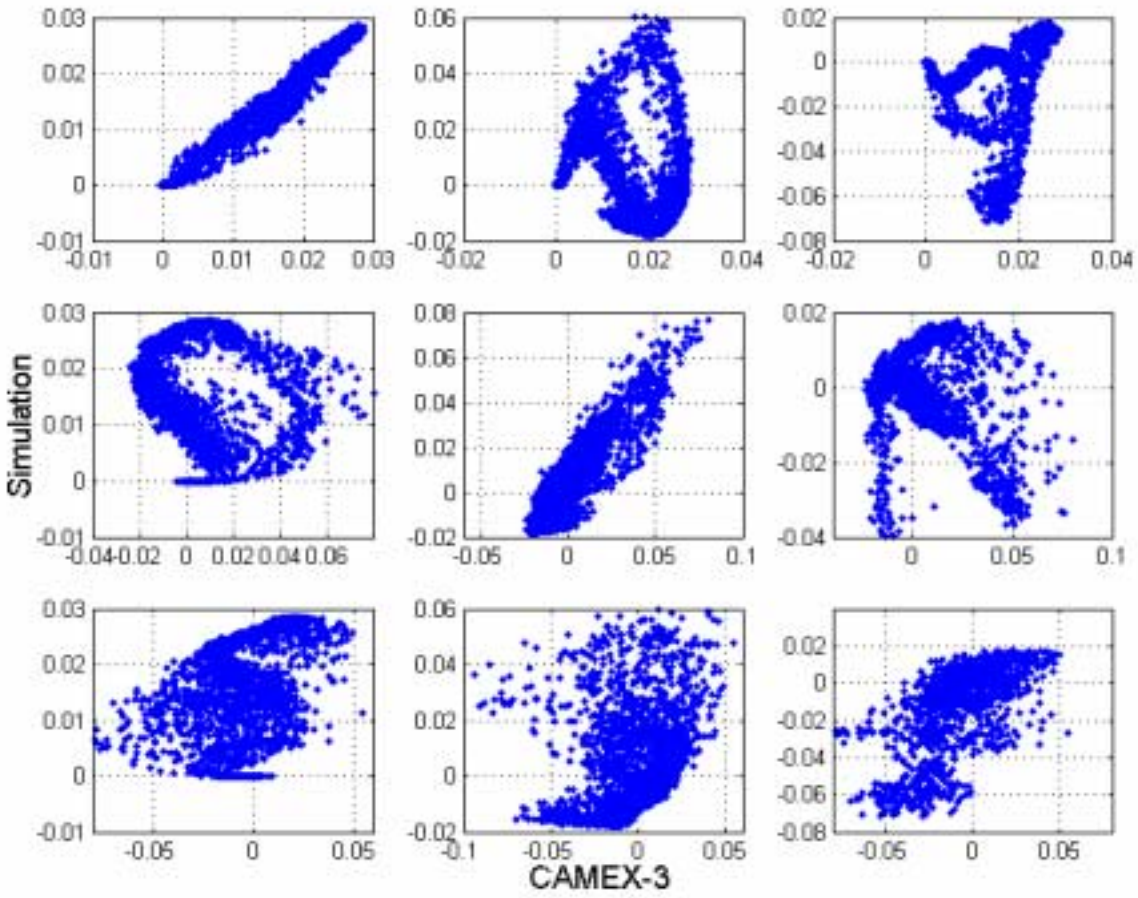
Simulation vs. CAMEX-3: Cloud Impact PC



- Simulated & observed cloud-perturbation PC's 1, 2 are very similar
- This implies cloud models used in simulation are fairly realistic

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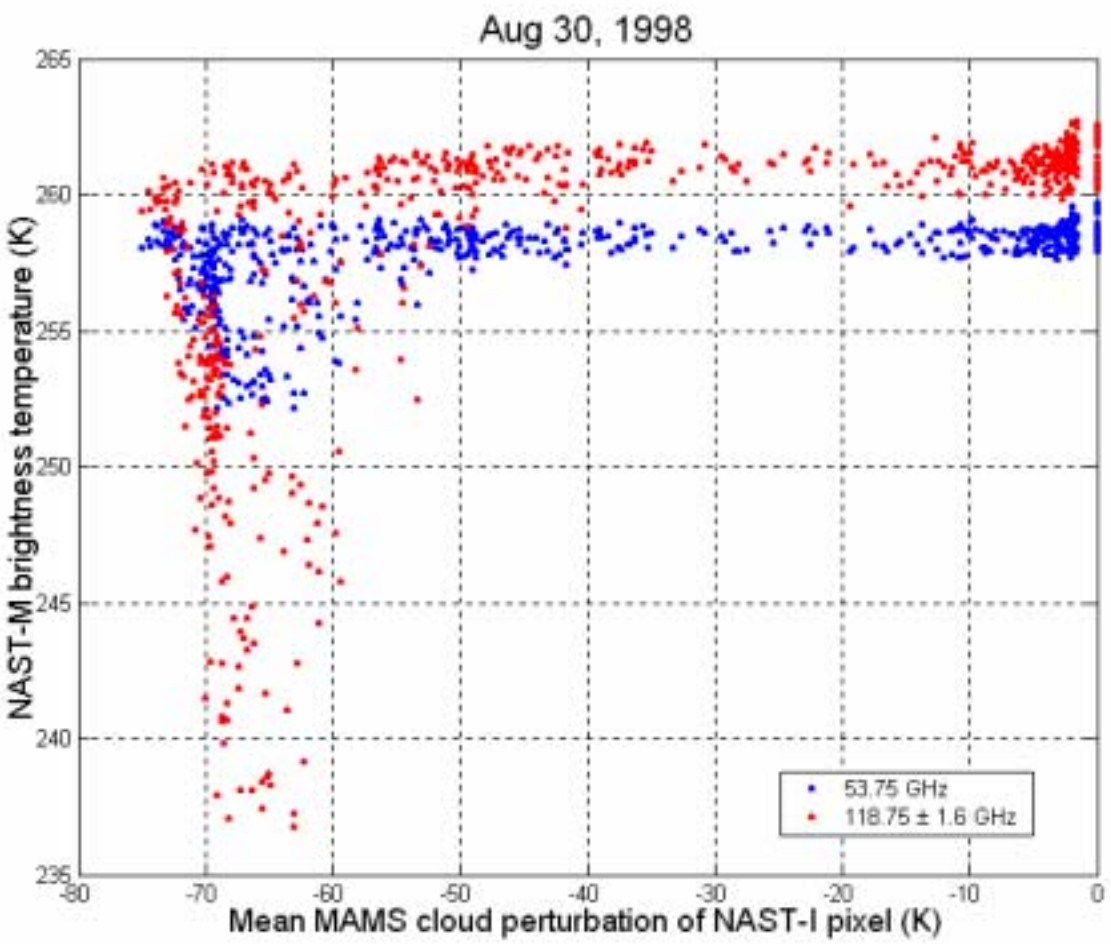
Cloud Impact on Microwave Brightness



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Summary / Conclusions

1. Radiance database of over 2500 pixels assembled for CAMEX-3: NAST-I/M, and cloud "truth"
2. Simulated cloud impact and observed cloud impact appear to agree based on PC analysis

Interesting future work:

1. Compare clearing/retrieval performance for simulation and CAMEX-3
2. Expand CAMEX-3 dataset to include WINTEX (wider variety of atmospheric conditions, more data over land).

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