Characteristics of the Cloudy Atmosphere Observed by AIRS

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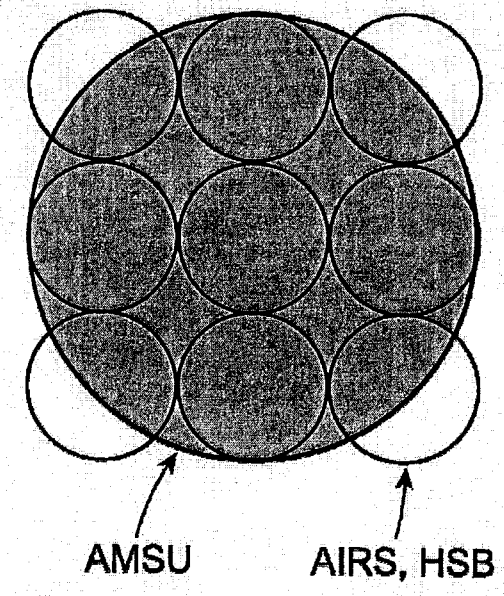
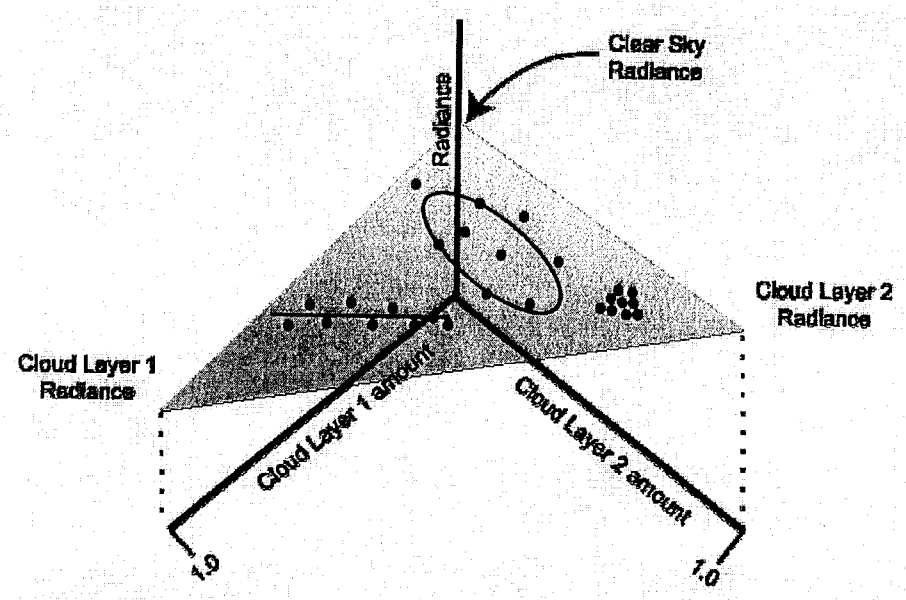
13th ITOVS Study Conference
2003 November 03

Cloud Clearing Theoretical Basis

- Consistency between microwave and infrared observations
- Homogeneity between adjacent footprints



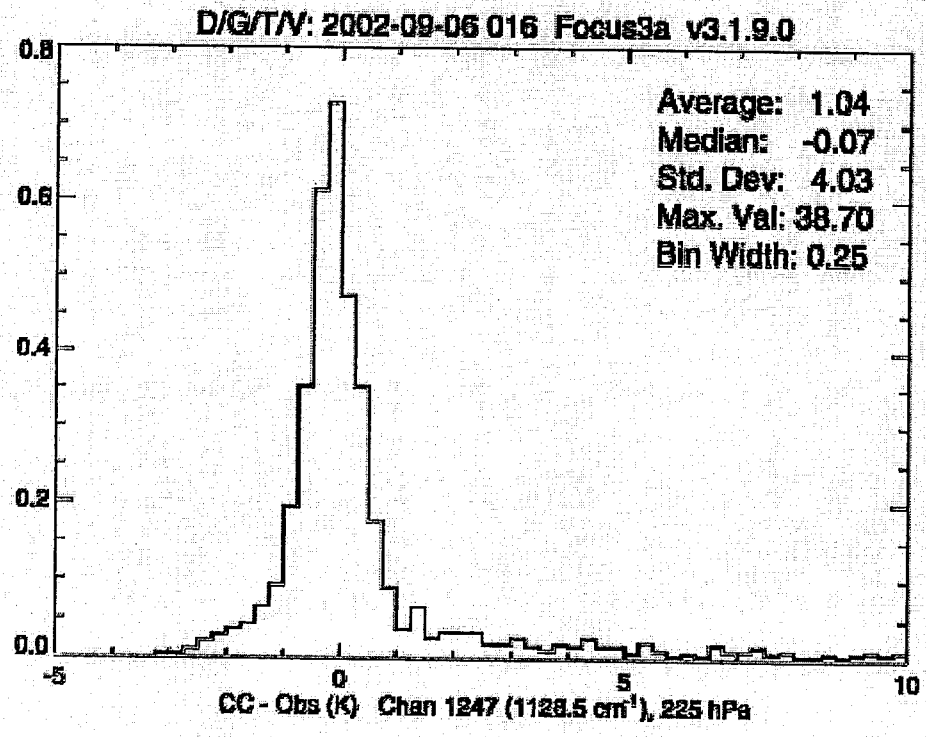


Quality Control

- Calibration Flags
  - L1B cal_flag = 0
  - L1B Cal_ChanSummary =0
- Noise Test, NeDT < 5K @ 250K
- Sanity check on radiances
  - $B_T > B\nu$ (180K)
  - $B_T < B\nu$ (360K)
- Ocean cases, land fraction = 0
- Equator ward of 40°
- Retrieval Type = 0, 10 (successful final)

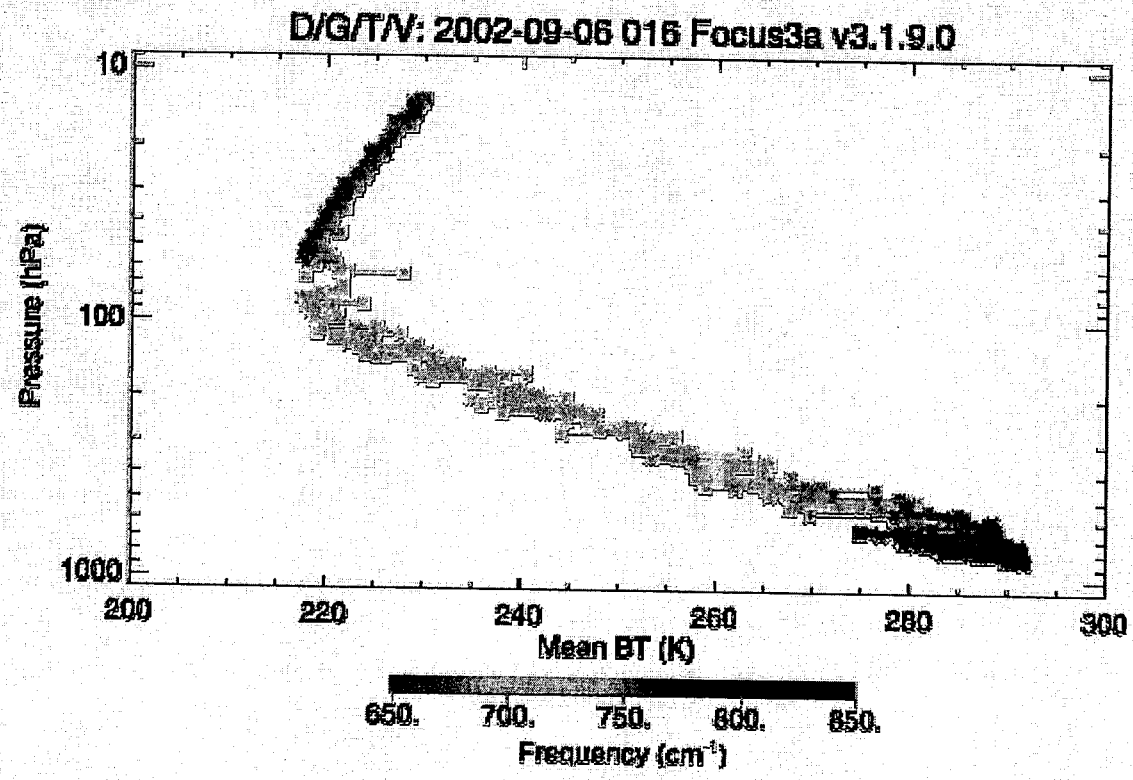
Histogram at 1128 cm^{-1}

- Large number of cases where CC < Obs
- At what level do these occur?



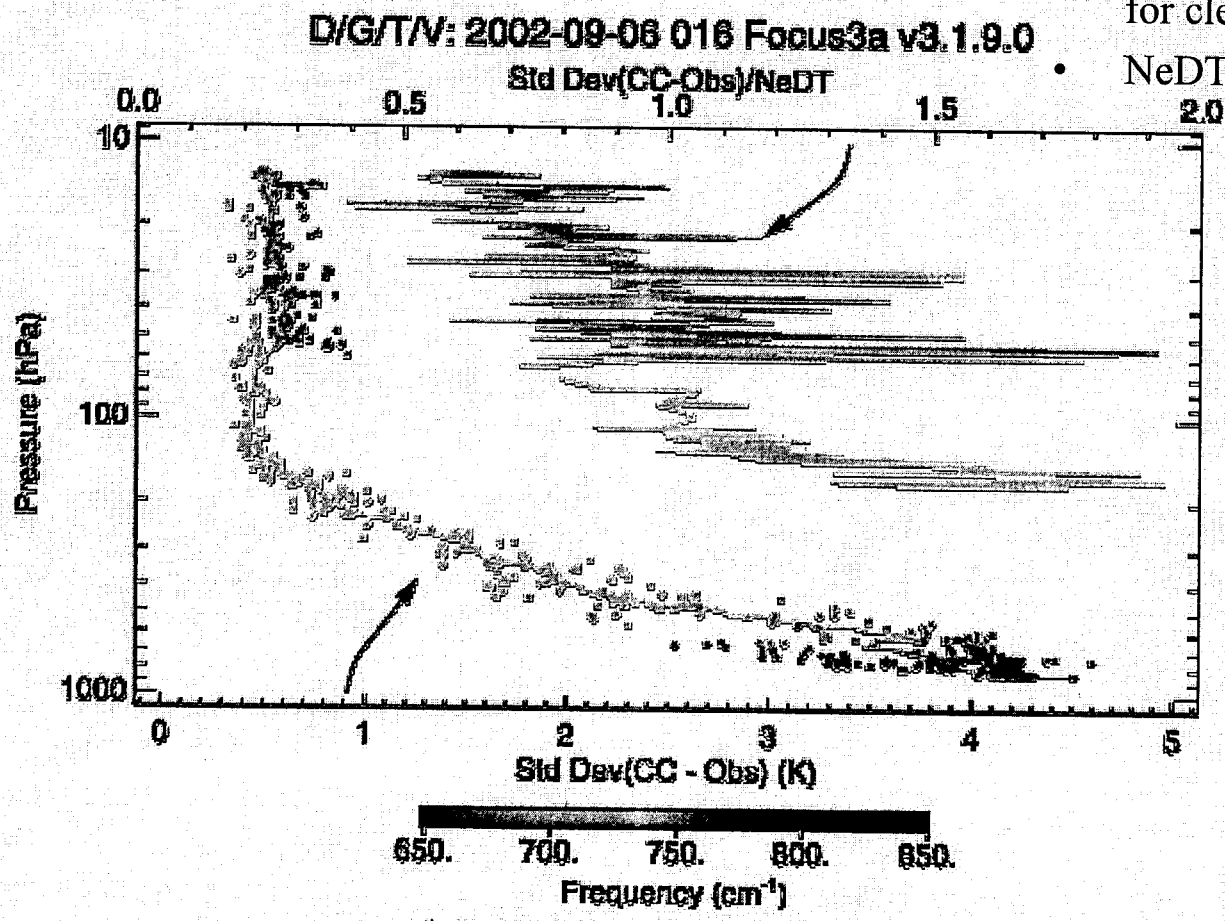
Mapping of Frequency onto Pressure

- Pressure weighted centroid of weighting function for standard atmosphere

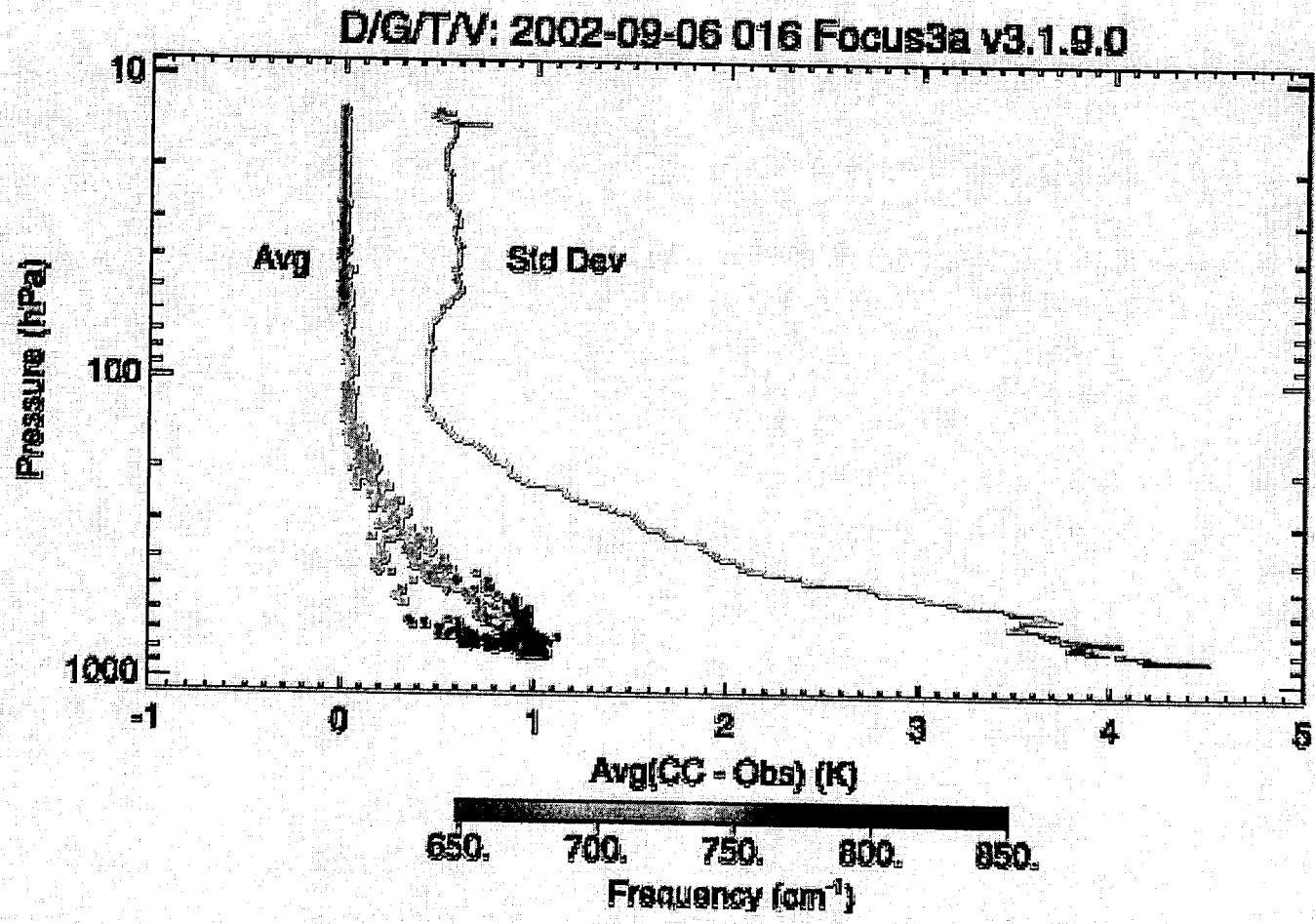


Vertical Structure of RMS Differences

- CC Noise reduced by 1/3 for clear footprints
- NeDT of difference < $\frac{\sqrt{10}}{3}$

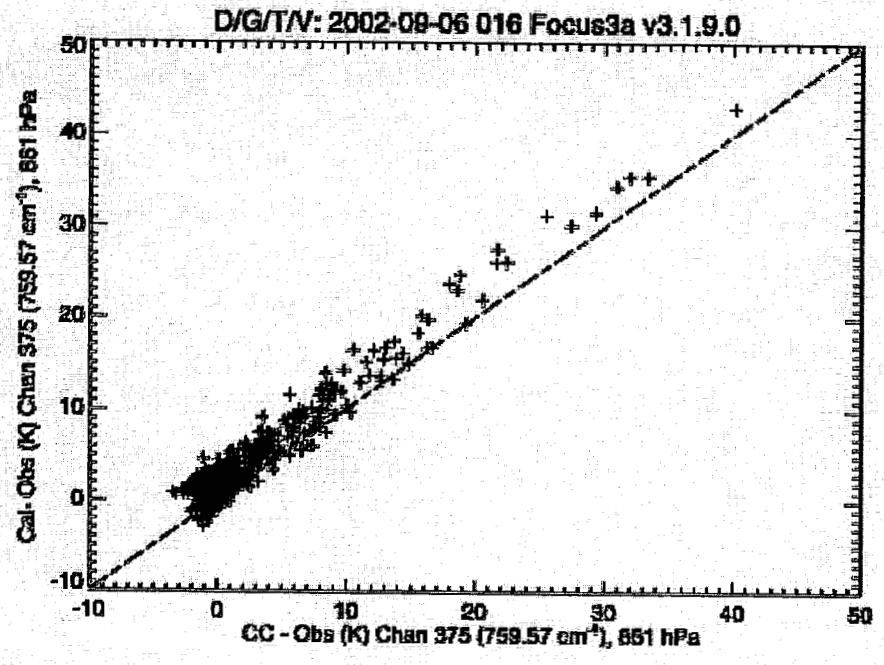


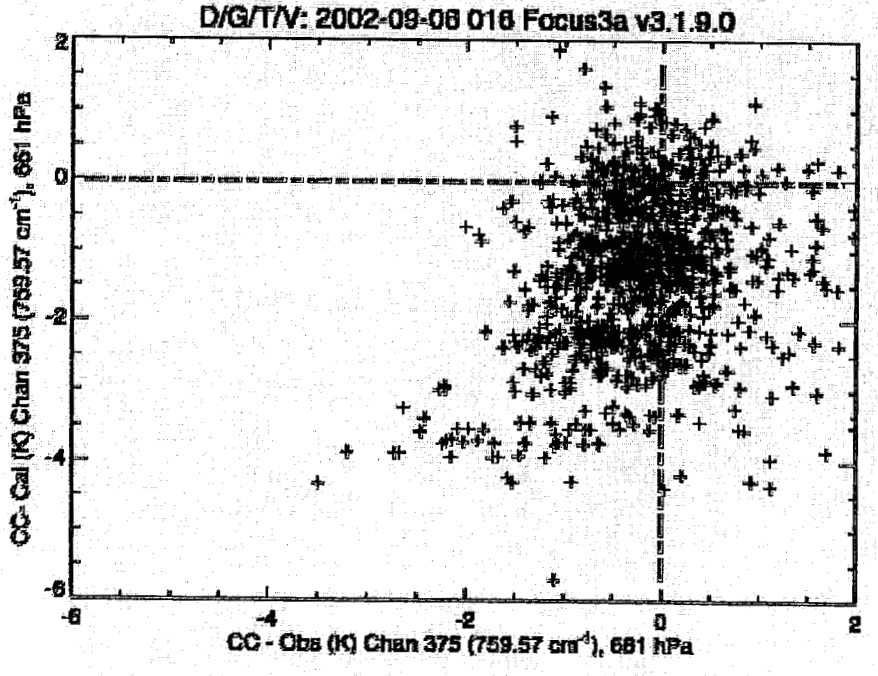
Vertical Structure of Average Differences



CC-Obs vs Cal -Obs

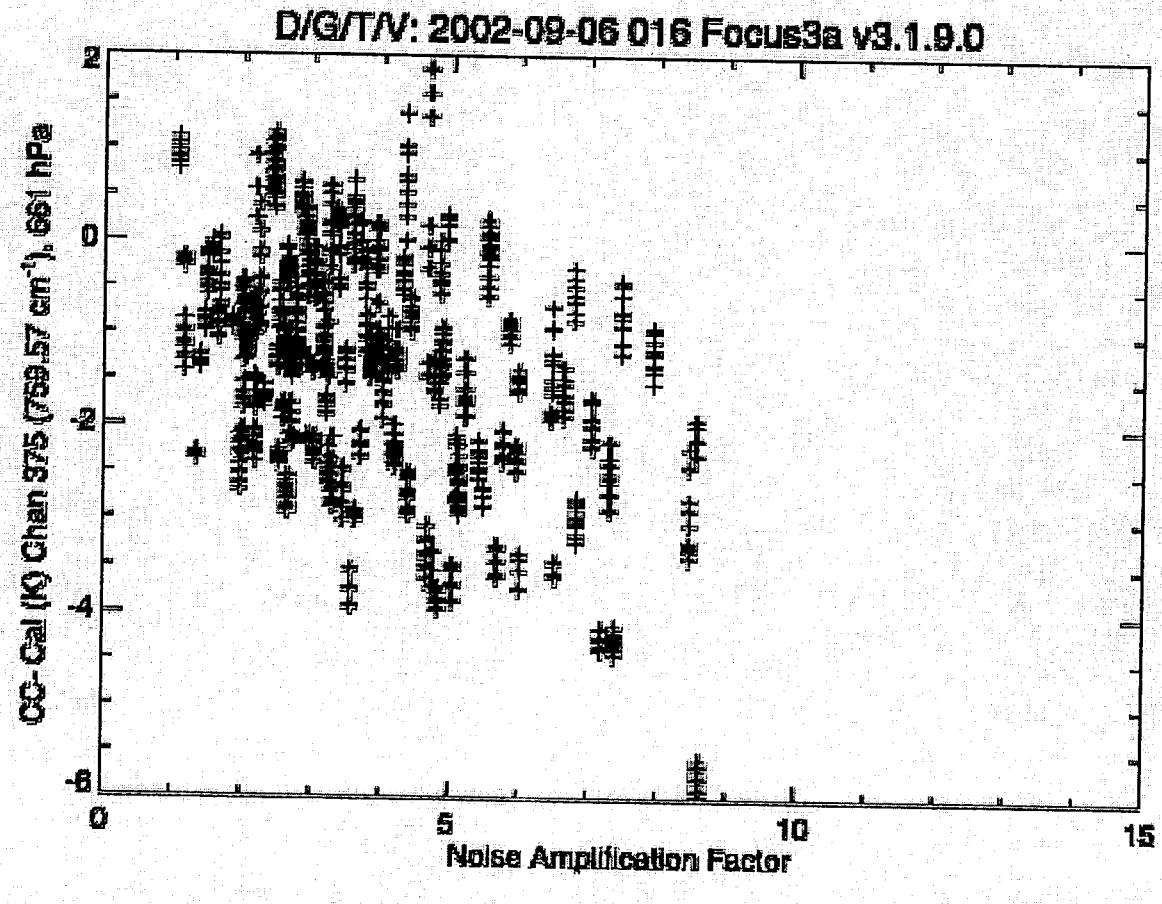
- Channel 375, 759.6 cm^{-1}
  - Centroid @ 661 hPa
  - NeDT @ 250K = 0.192 K





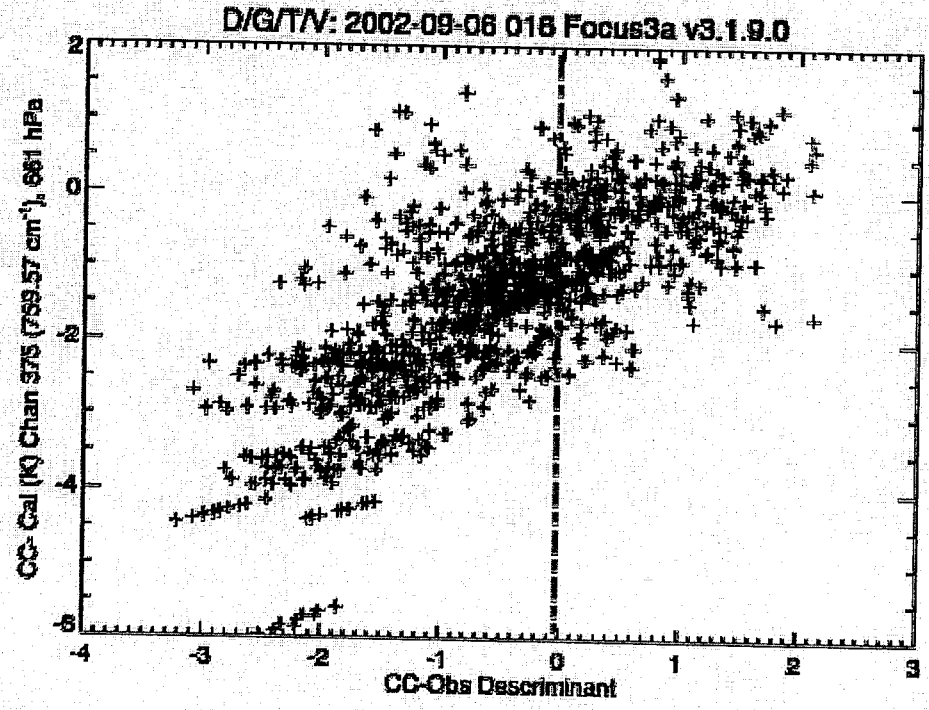
CC – Cal (ECWMF) vs NaF

- Correlation between NAF and CC – Cal



Cloud Clearing Test

- Attempting to cloud clear for large NaF
- Negative bias in CC-Obs over large region of atmosphere –far from surface



$$\text{Discr} = \sum_{i \subset [600,\,650]\,\text{cm}^{-1}} \frac{(T_{i\text{CC}} - T_{i\text{Obs}})}{Ne\Delta T_i}$$

Conclusion

- Cloud clearing is working
- Cloud cleared radiances are often smaller than observed
- Systematic errors are amplified by NaF
  - Are solutions useful when NaF > 4?