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Water vapor intercomparisons
TES - AIRS - AMSR

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April 15, 2005

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California Institute of Technology
Jet Propulsion Laboratory

xx May 2005

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TES status

- Observations made from late Aug 2004 to mid-April 2005 - global surveys and special observations
- Translation mechanism showing signs of increased friction, as was anticipated from life test unit
- Changed GS to only use nadir scans - reduces translation by 75%
- Measurement re-commenced on 4/24

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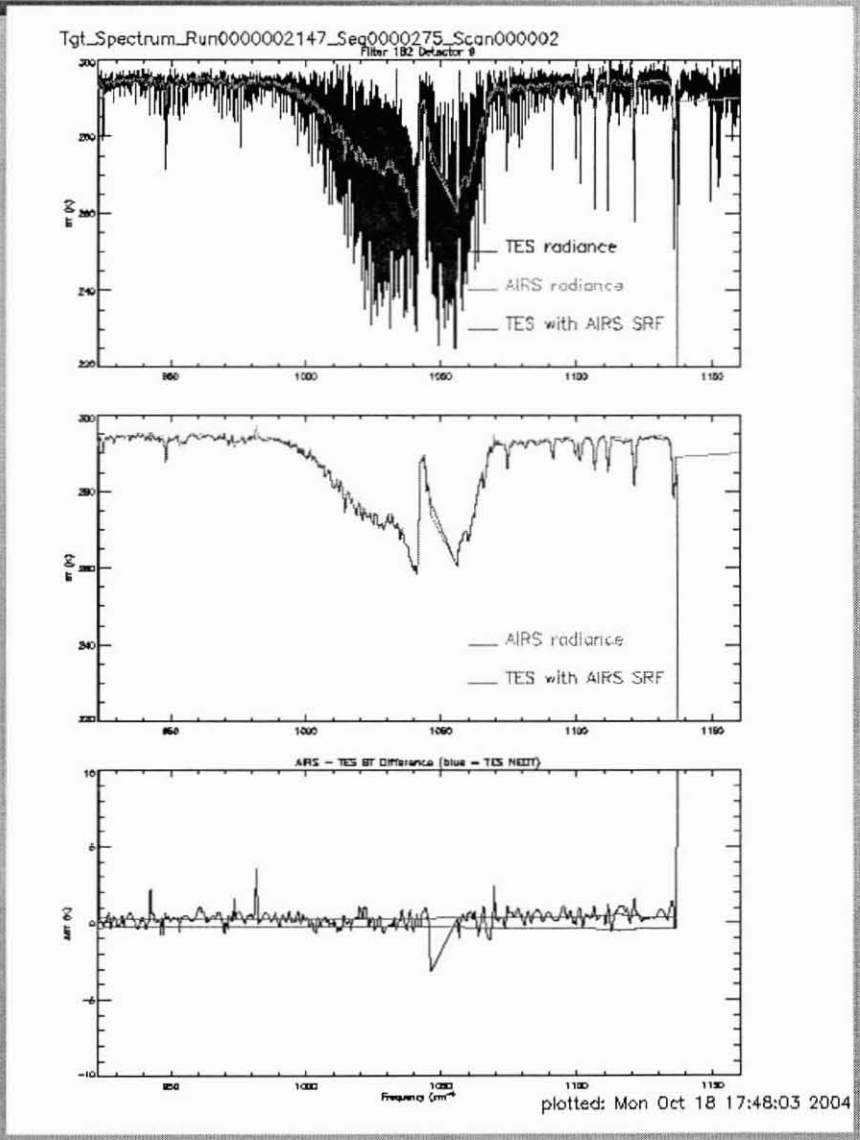
Radiance calibration

- Using AIRS radiances selected with George Aumann's help to identify clear/homogeneous scenes
- Continuing development of TES algorithms, comparing to AIRS as a reference



Processing status

- PGEs being updated and delivered to SIPS (TES SIPS is at Raytheon)
- L1B now available at DAAC
- Plan to have L2 available in July
- In-house processing for 6 global surveys and many special observations
- 2147 - Sept 20/21, other Nov4-17th, 2004

Data selection for this analysis

- **QA approach - TES data is used when**
  - radiance residual rms (rms about the mean) less than 1.4
  - radiance residual mean (mean difference divided by the NESR) less than 0.1
- **Considering other screens (problematic desert surfaces and cold surfaces not identified with the current approach)**
- **AIRS data - v3.5 ret type 0 and 10 (by next week, v4 with QC_H2O =0**

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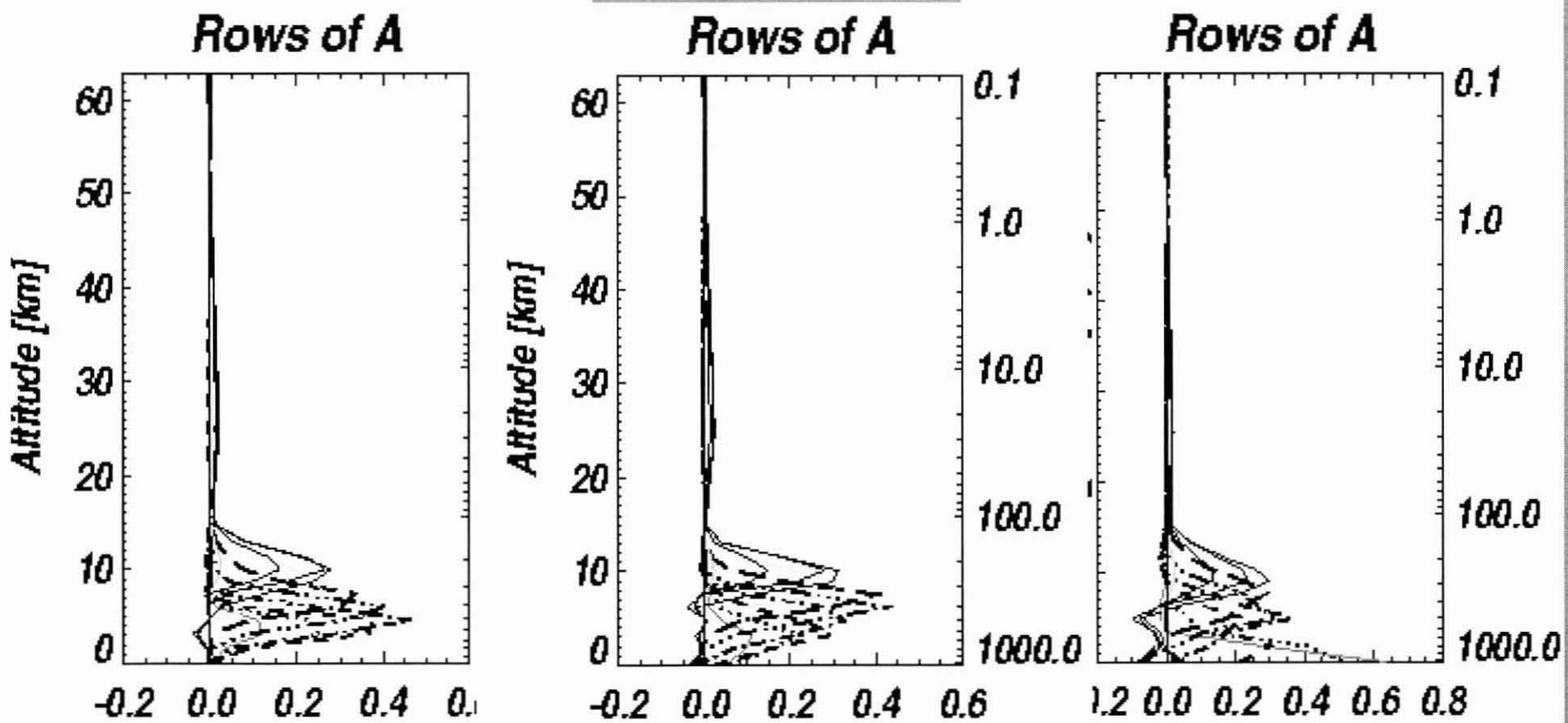
TES Averaging kernals - water

- TES loses sensitivity above 200mb



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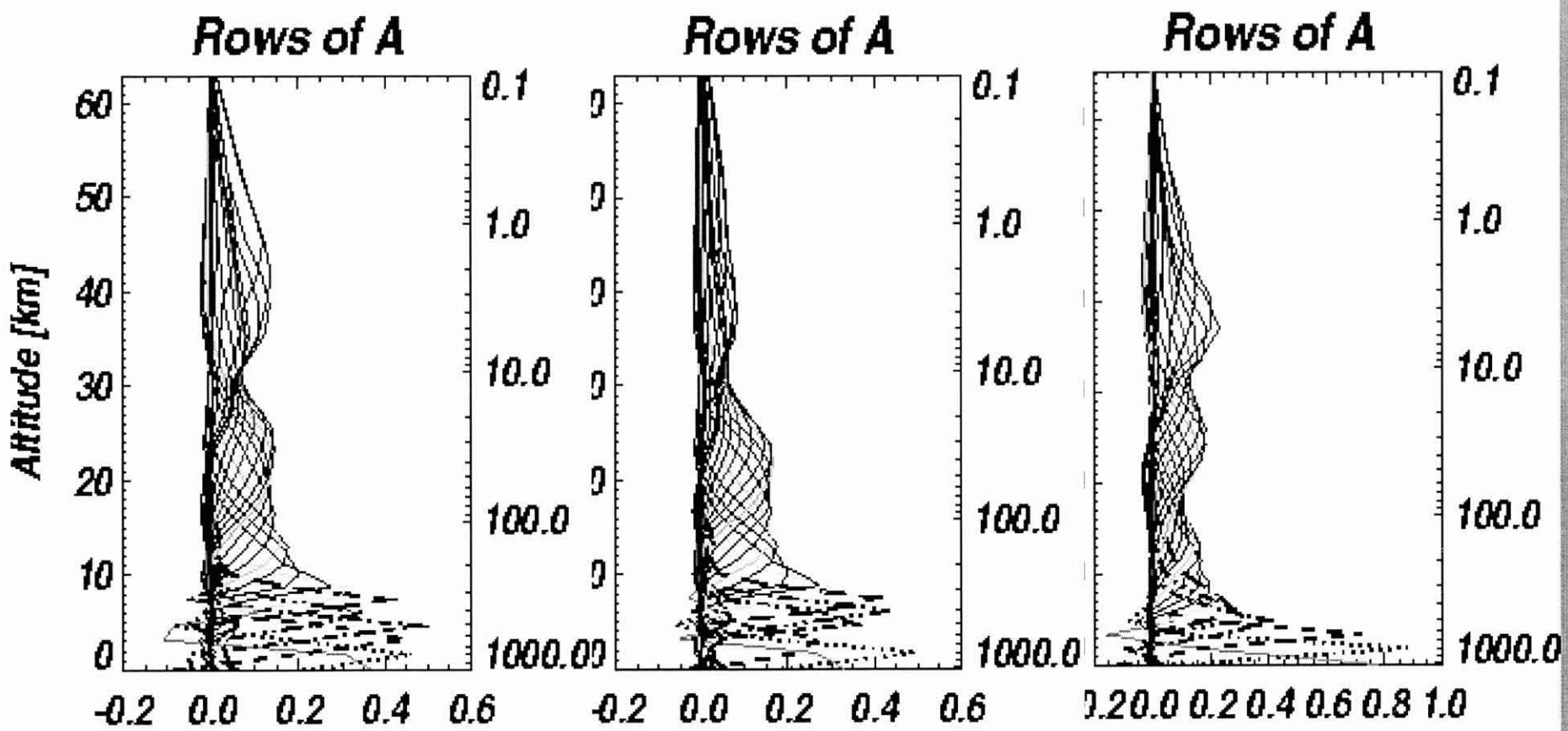
TES Averaging kernals - temperature

- Sensitivity throughout the atmosphere



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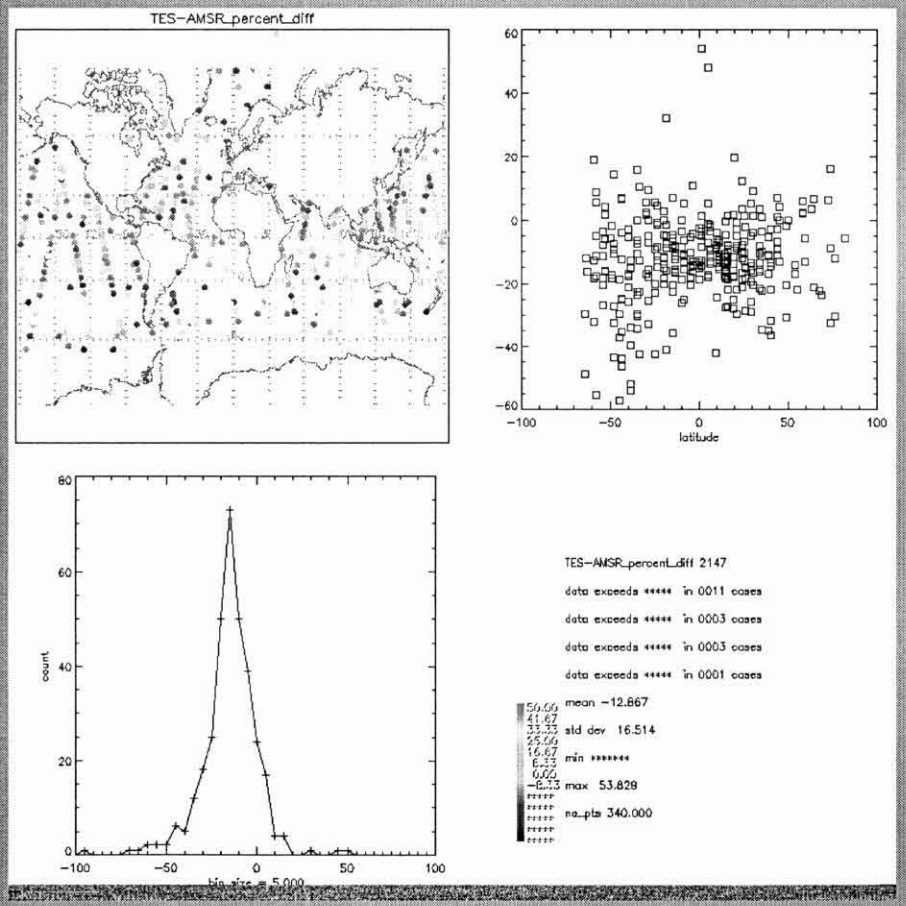
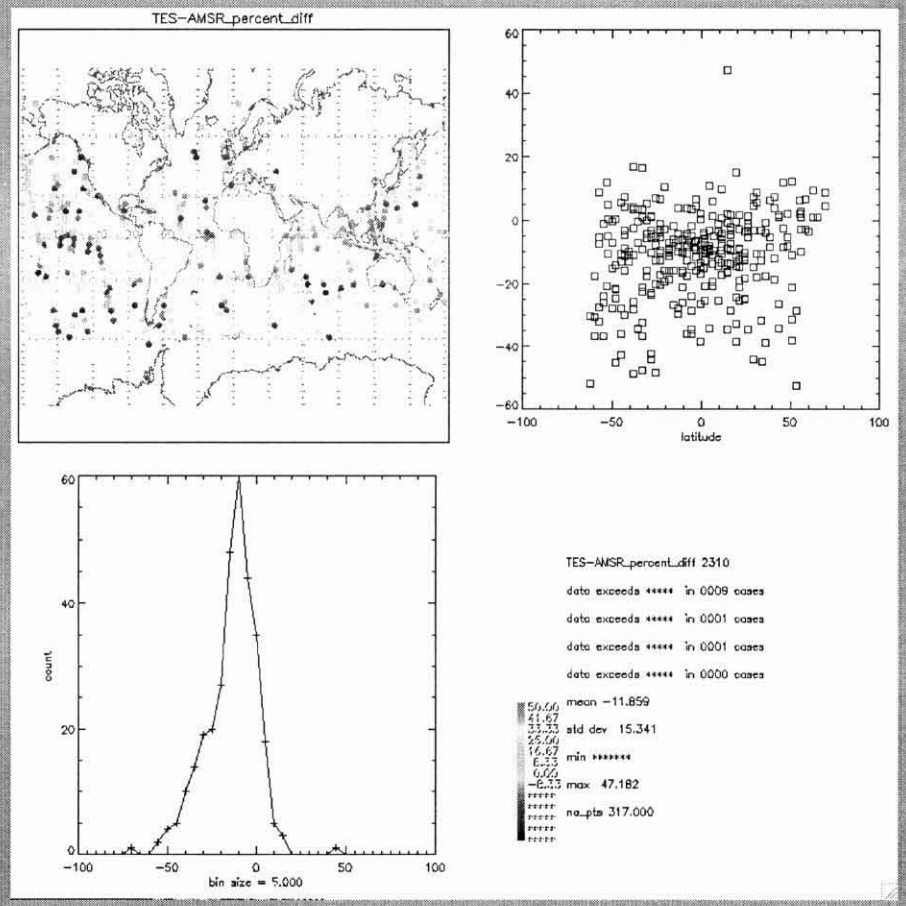
Total water difference - - 2147& 2310

TES is ~12% drier than AMSR-E in total column





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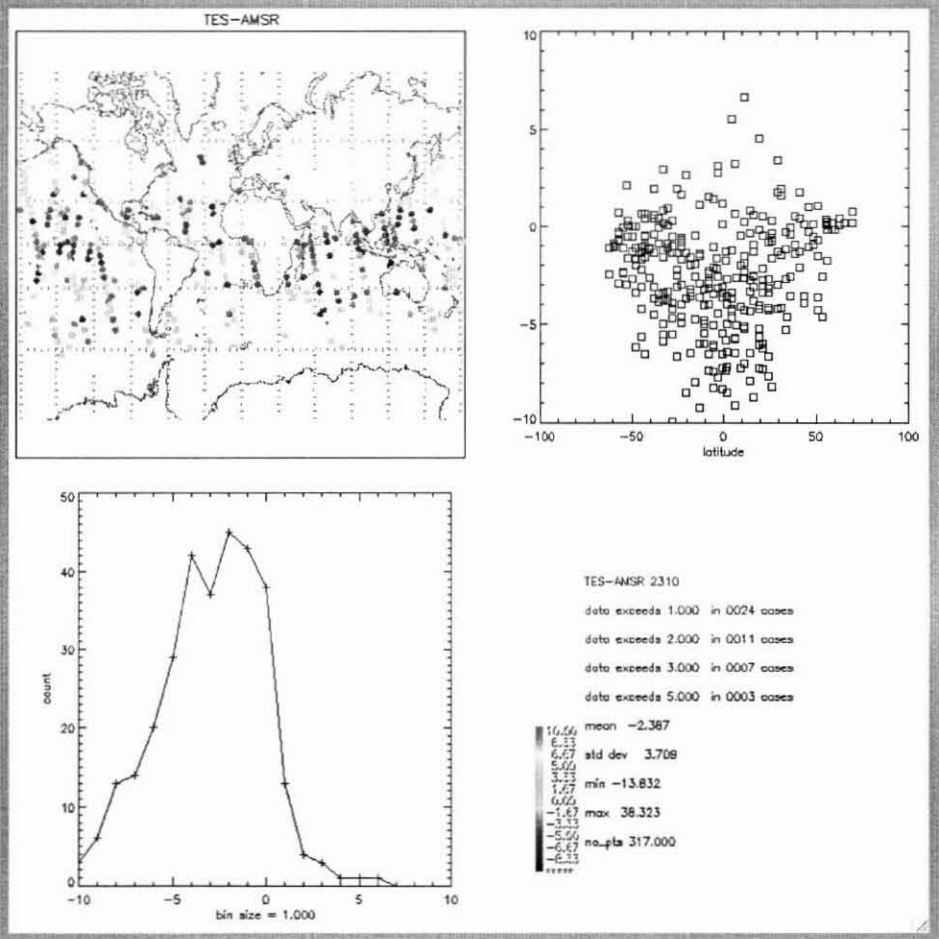
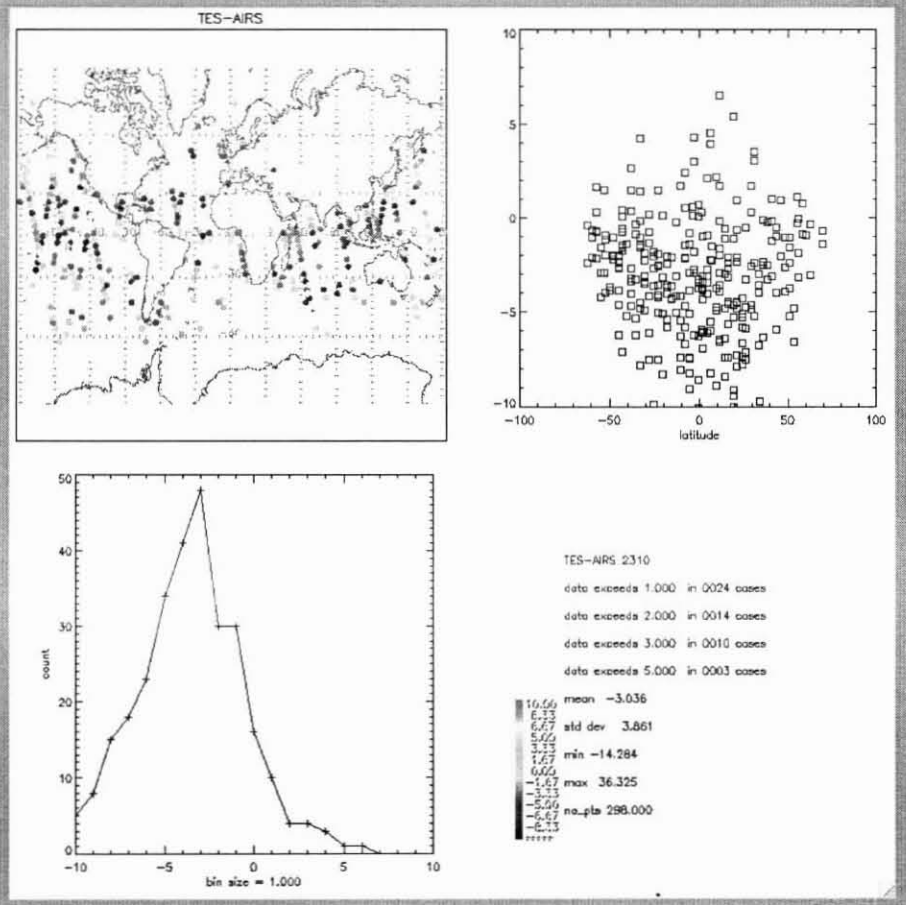
Comparison AMSR and AIRS - 2310

TES-AIRS column comparison same as TES-AMSR - TES drier





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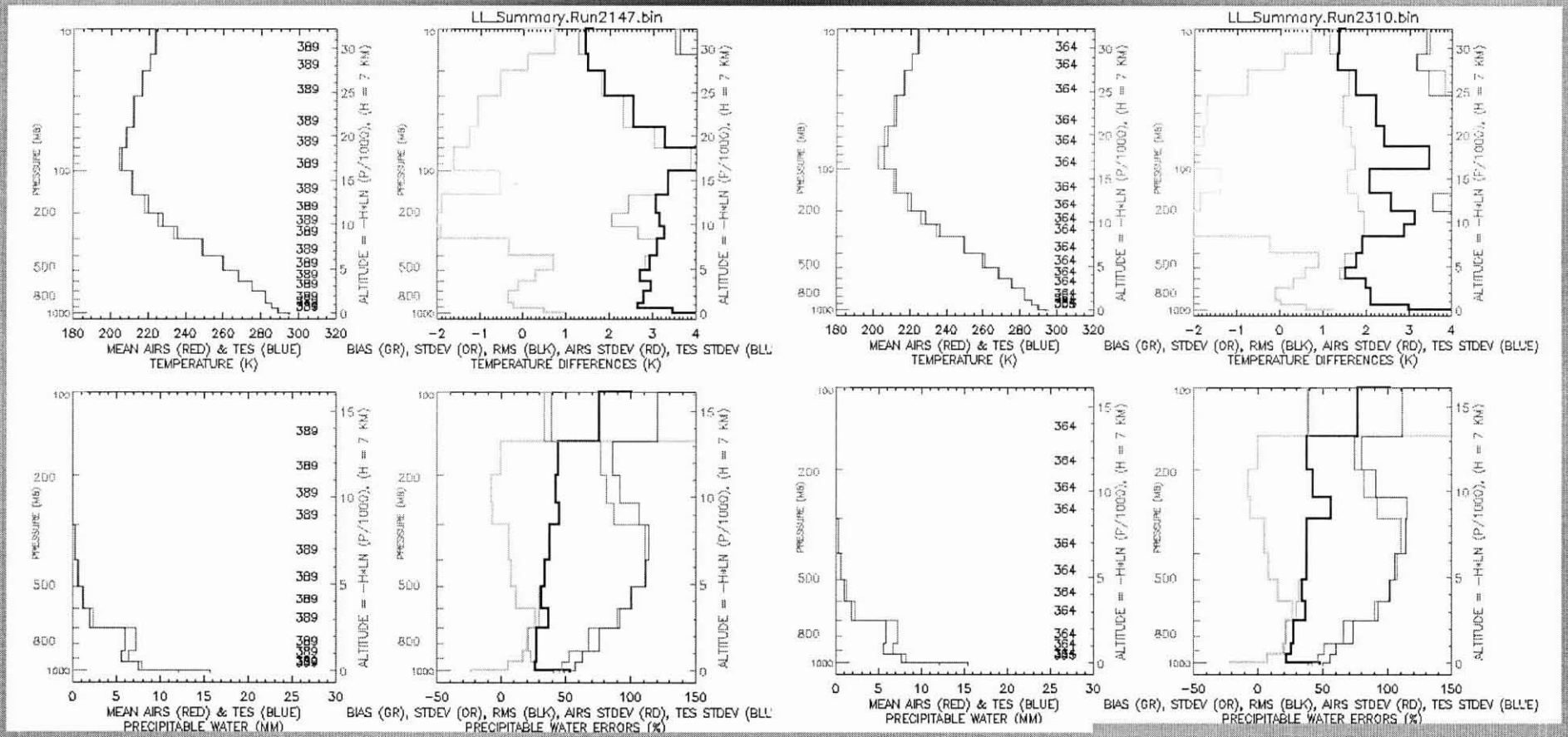
What do profiles say?



Percent diff is (airs-tes)/tes

TES warmer than AIRS near tropopause, TES drier than AIRS near surface - may be related to AIRS vertical structure in retrieval scheme. Consistent with total column water vapor.

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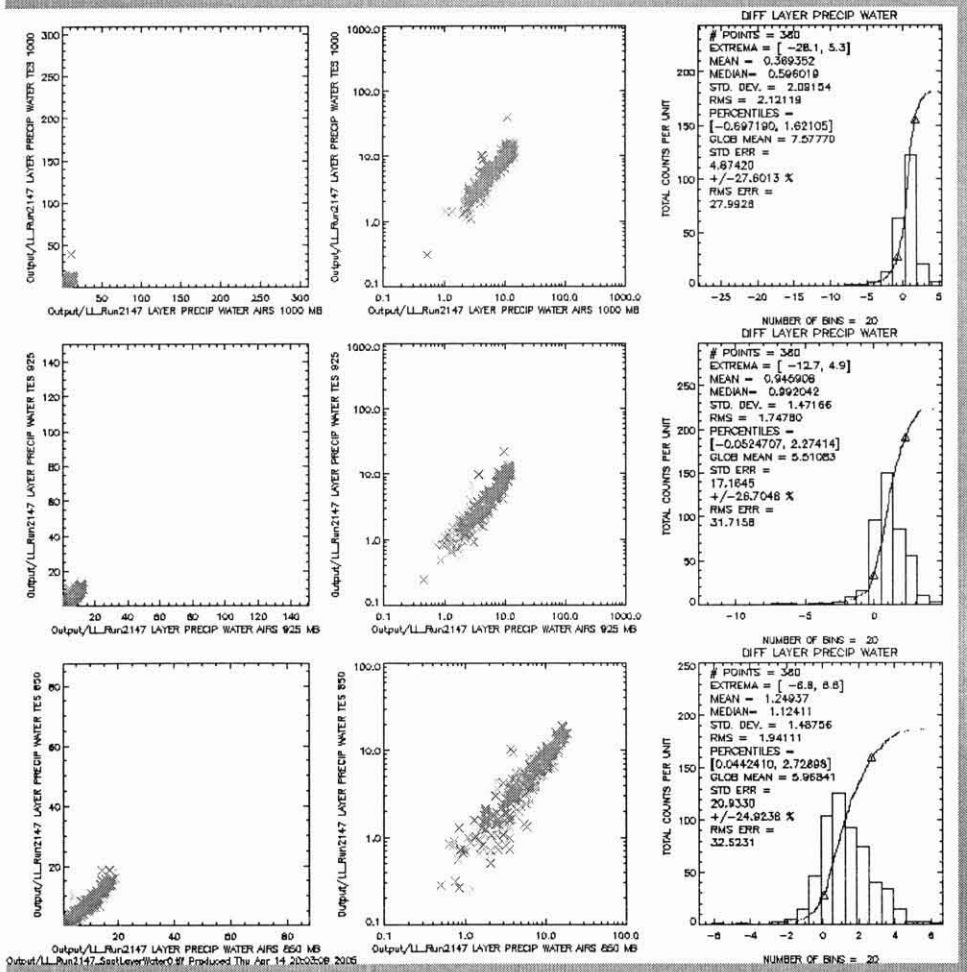
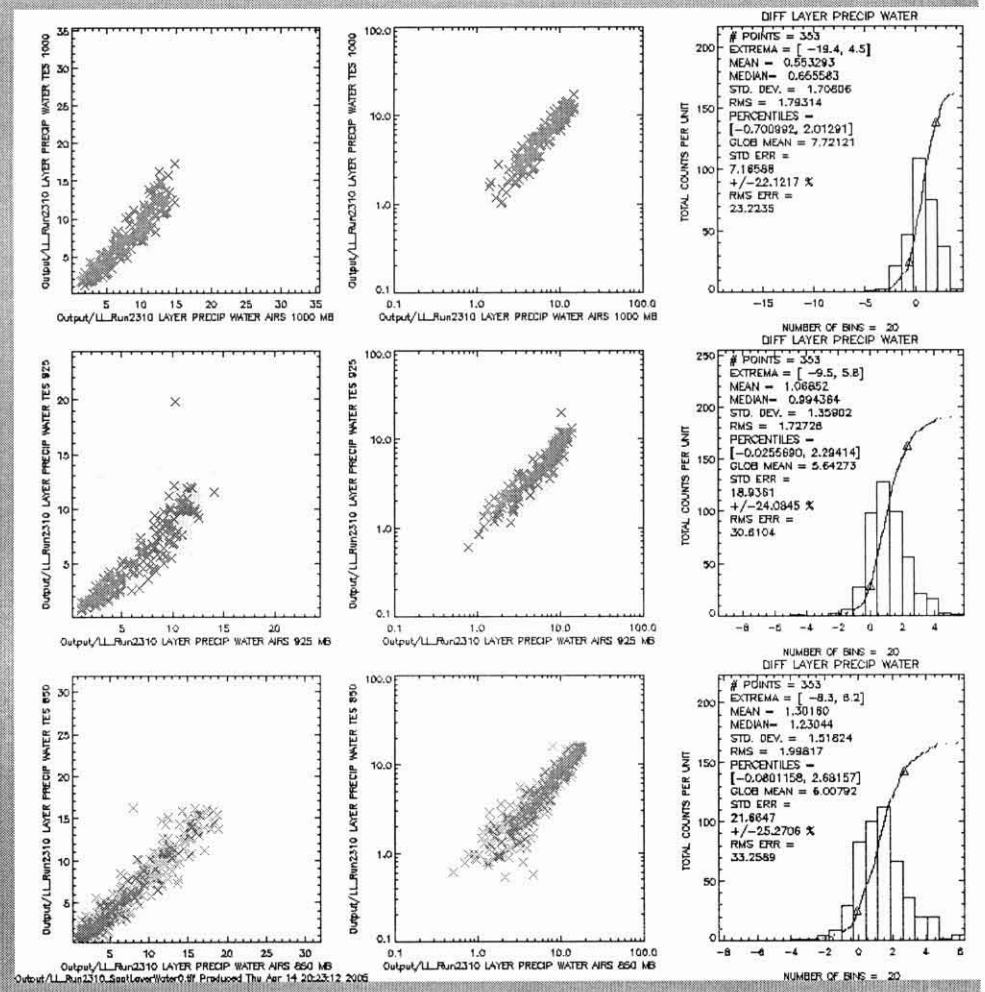
Scatter plots of near surface water 2417 and 2310





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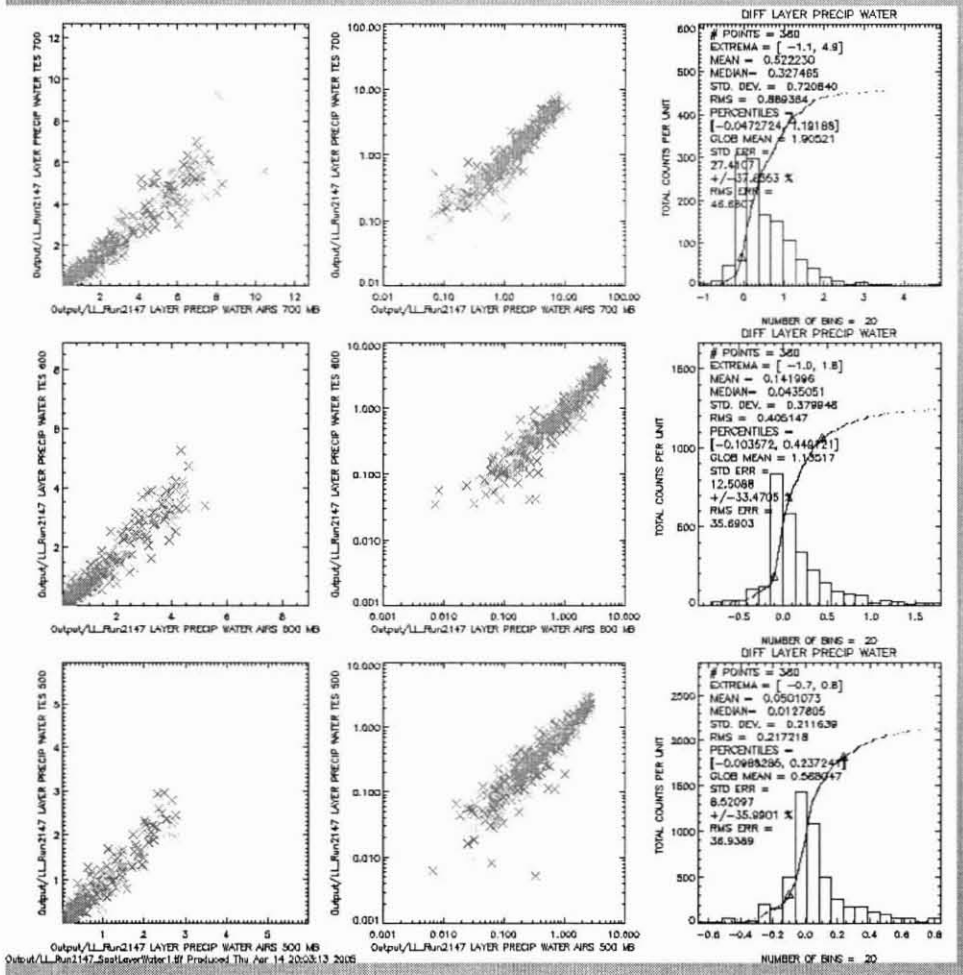
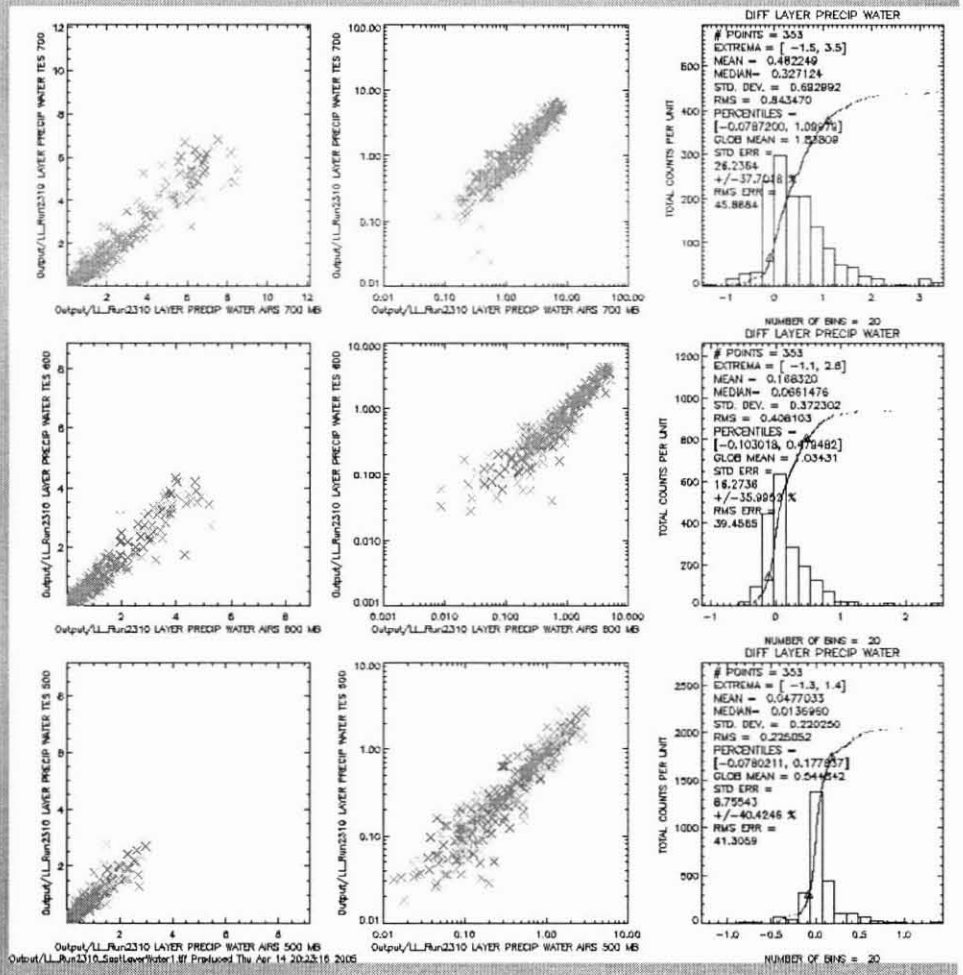
Scatter plots of mid trop water 2417 and 2310





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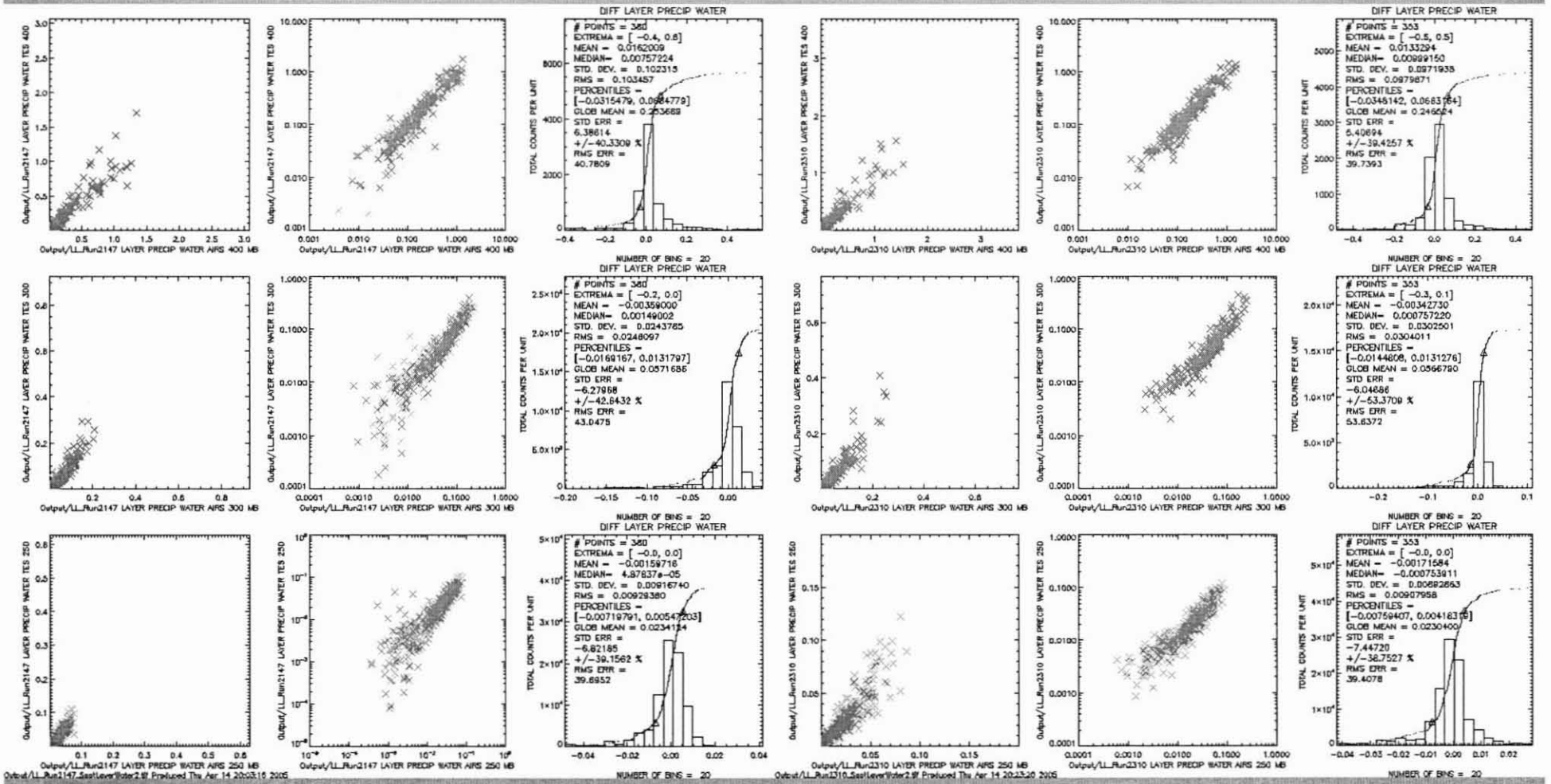
Scatter plots of upper trop water 2417 and 2310



Conclusions

- **Total column and profile data both show consistency - TES is drier that AMSR and AIRS by 12%. Most of that difference is between 700 and 900mb. Need to investigate a number of possible explanations.**
  - Is this an IR-microwave bias?
  - TES uses a different set of channels for retrievals than AIRS
  - TES still modifying radiance calibration
- **This analysis holds for all global surveys.**
- **Beginning analysis of special observations in the tropics**