Passive Microwave Radiometers for Temperature and Moisture Profiling

James C. Liljegren and Maria P. Cadeddu
Decision and Information Sciences Division
Argonne National Laboratory

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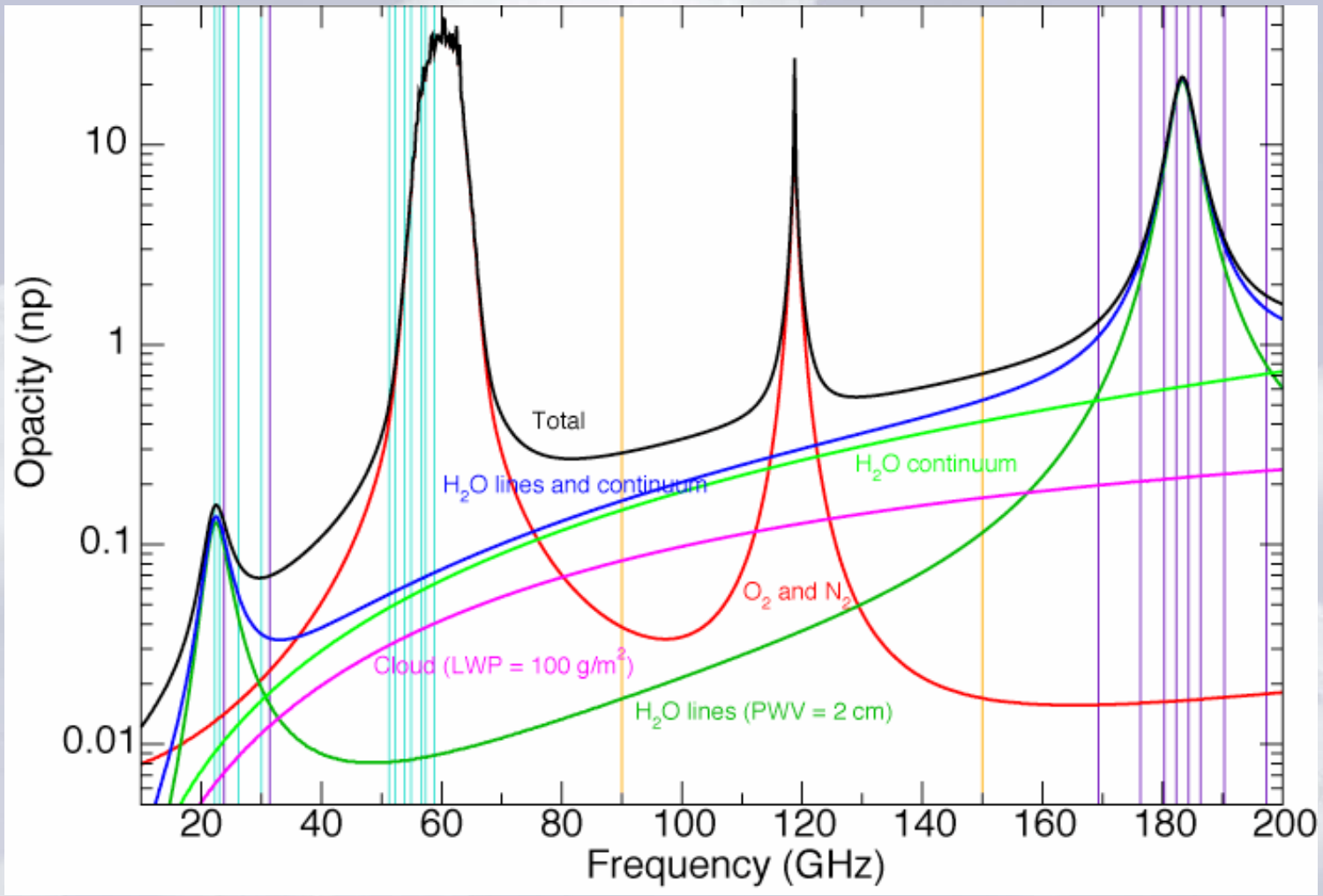
Atmospheric Radiation Measurement
Climate Research Facility
U.S. Department of Energy

Office of Science
U.S. Department of Energy

Microwave Absorption Spectrum



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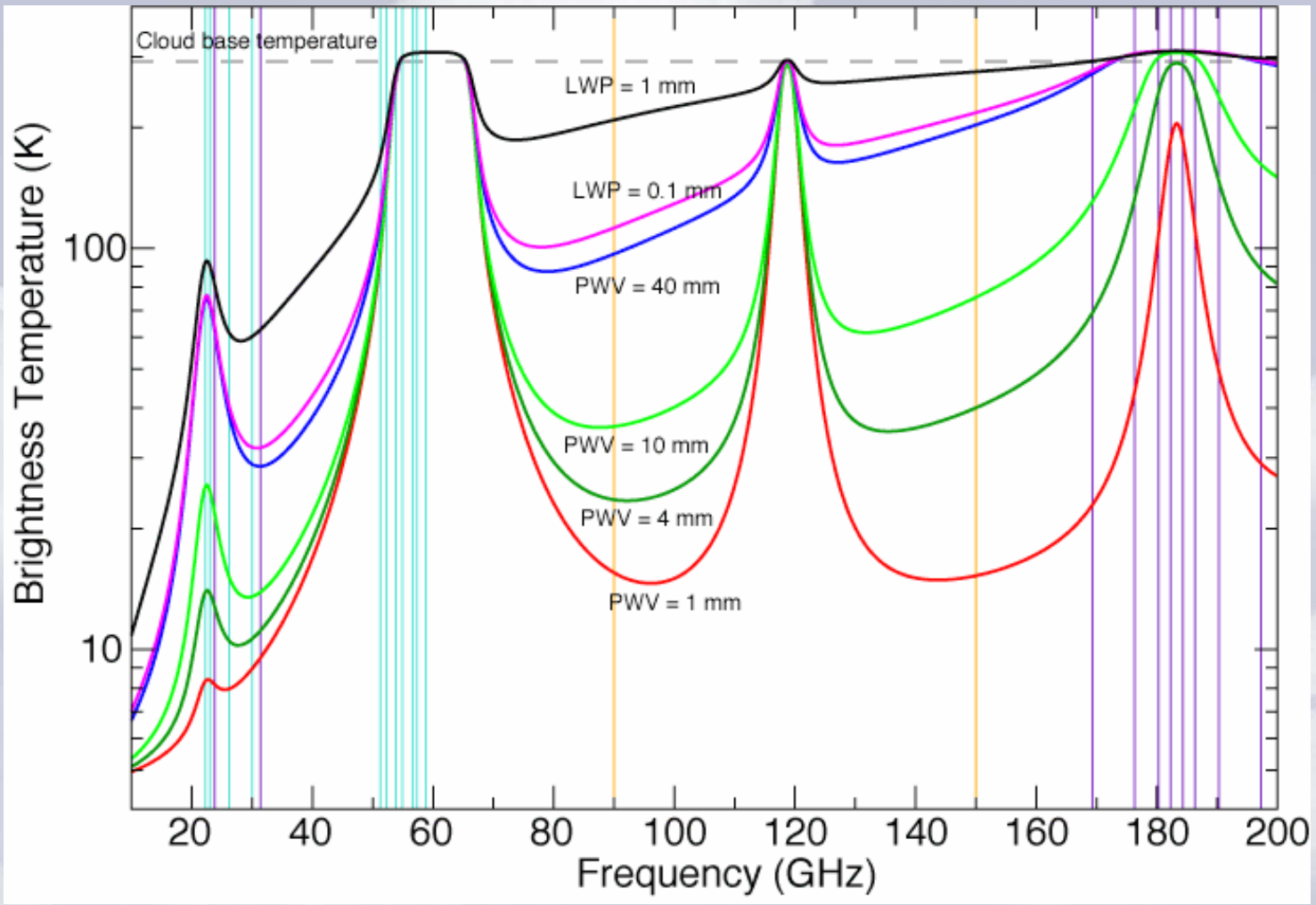
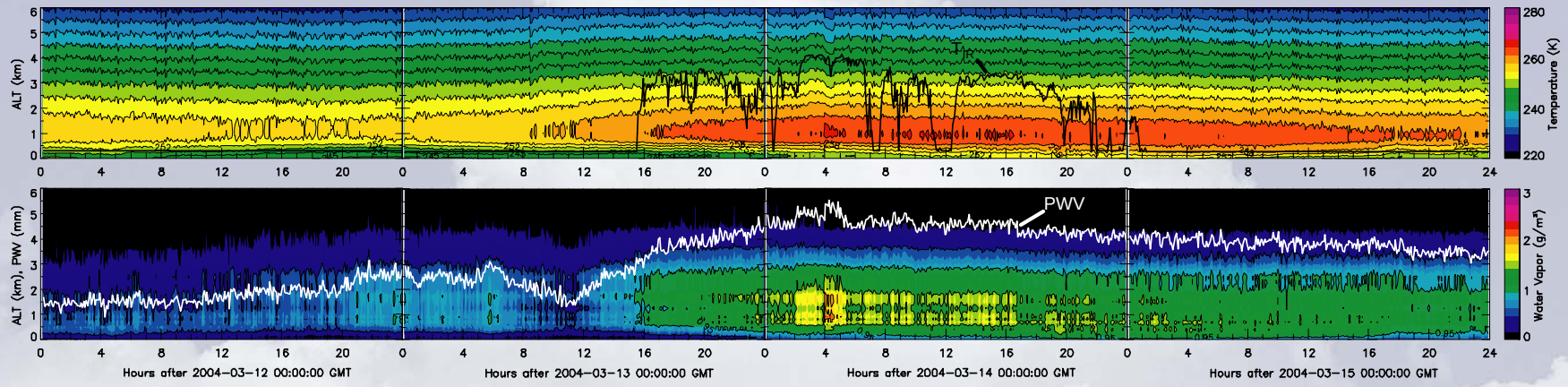
Brightness Temperature Spectrum

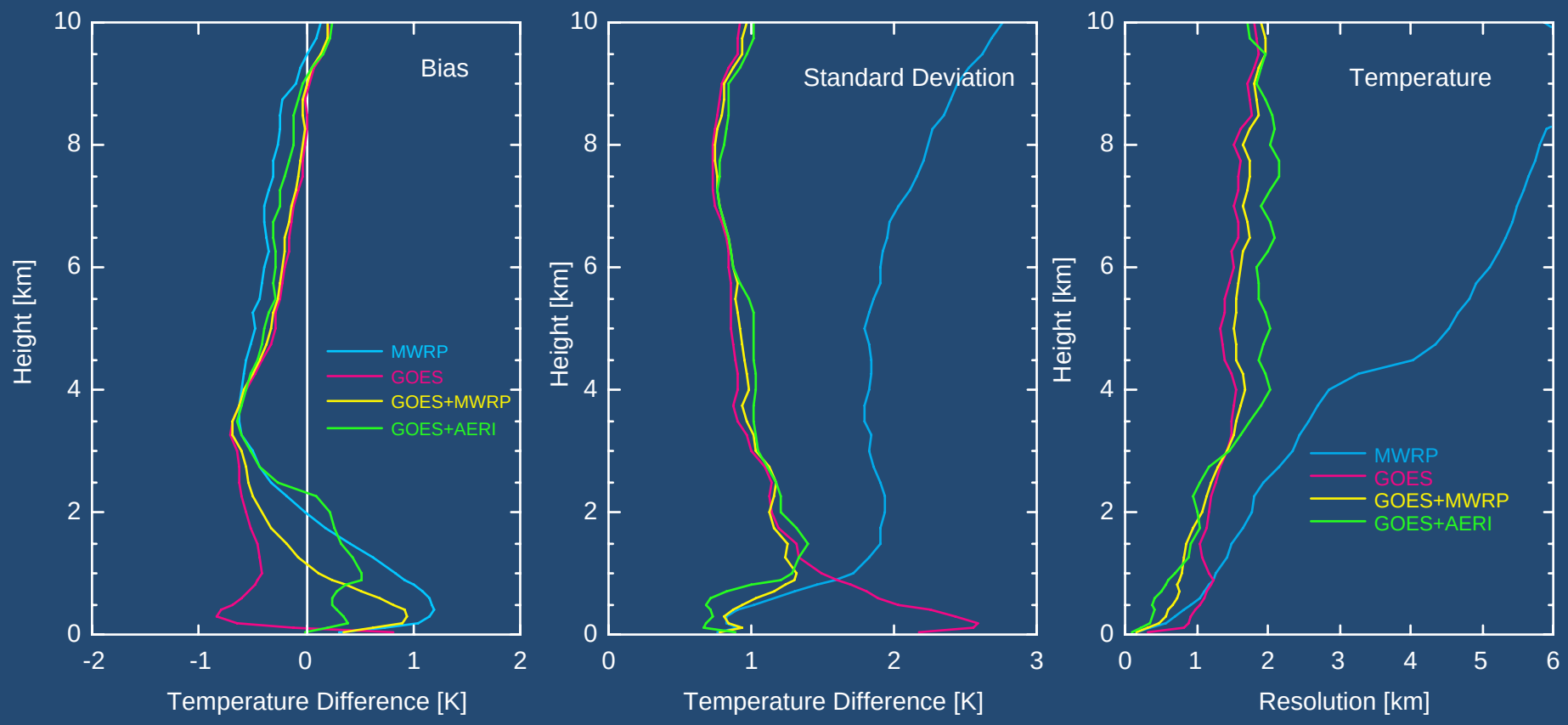


Passive Microwave Profiler

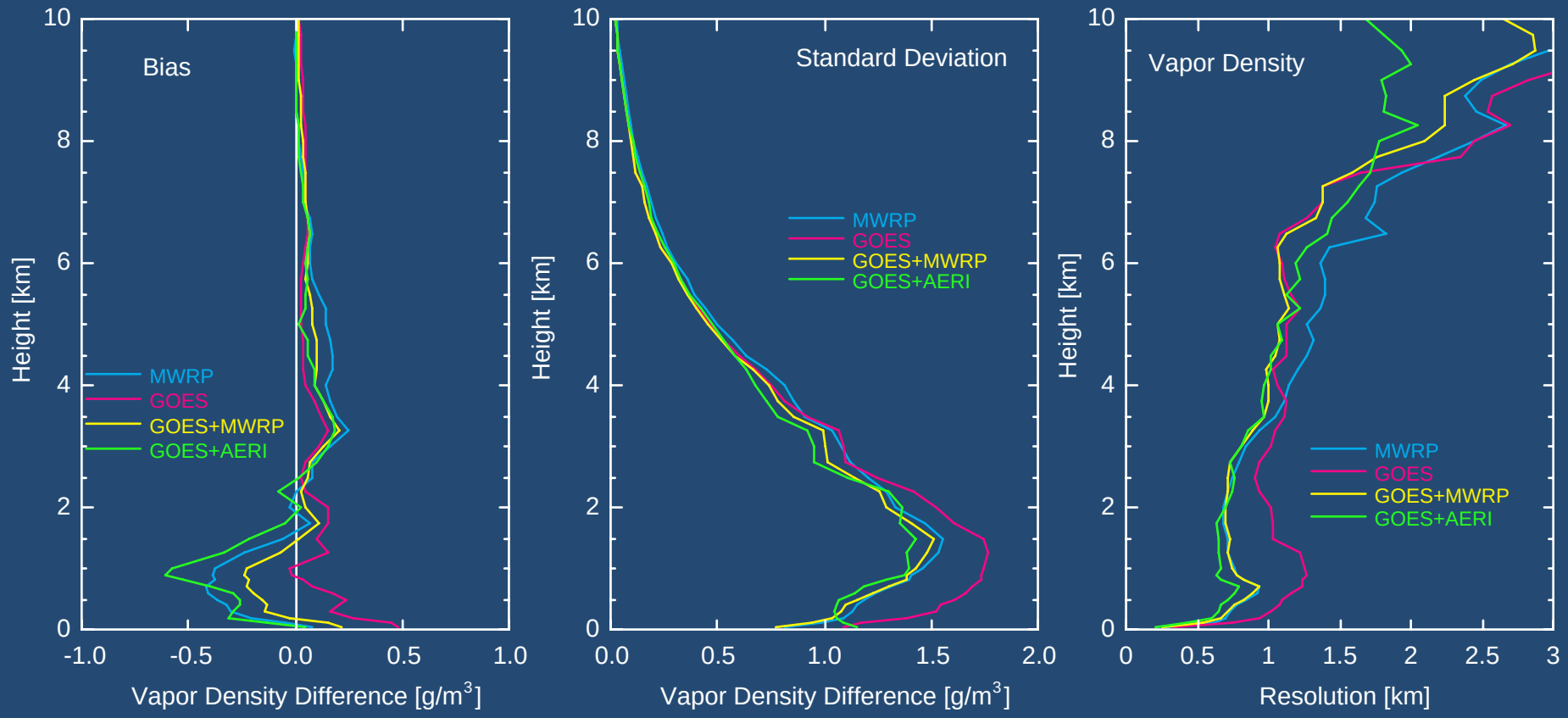


- Continuous profiling to supplement radiosondes
- Temporal and vertical resolution trade-off
- Elevated inversions and moisture gradients difficult to resolve
- Multi-angle retrievals, combined sensor retrievals
- Retrieval algorithm methodologies
- Effect of weather conditions
- Reliability, autonomy → low operating cost

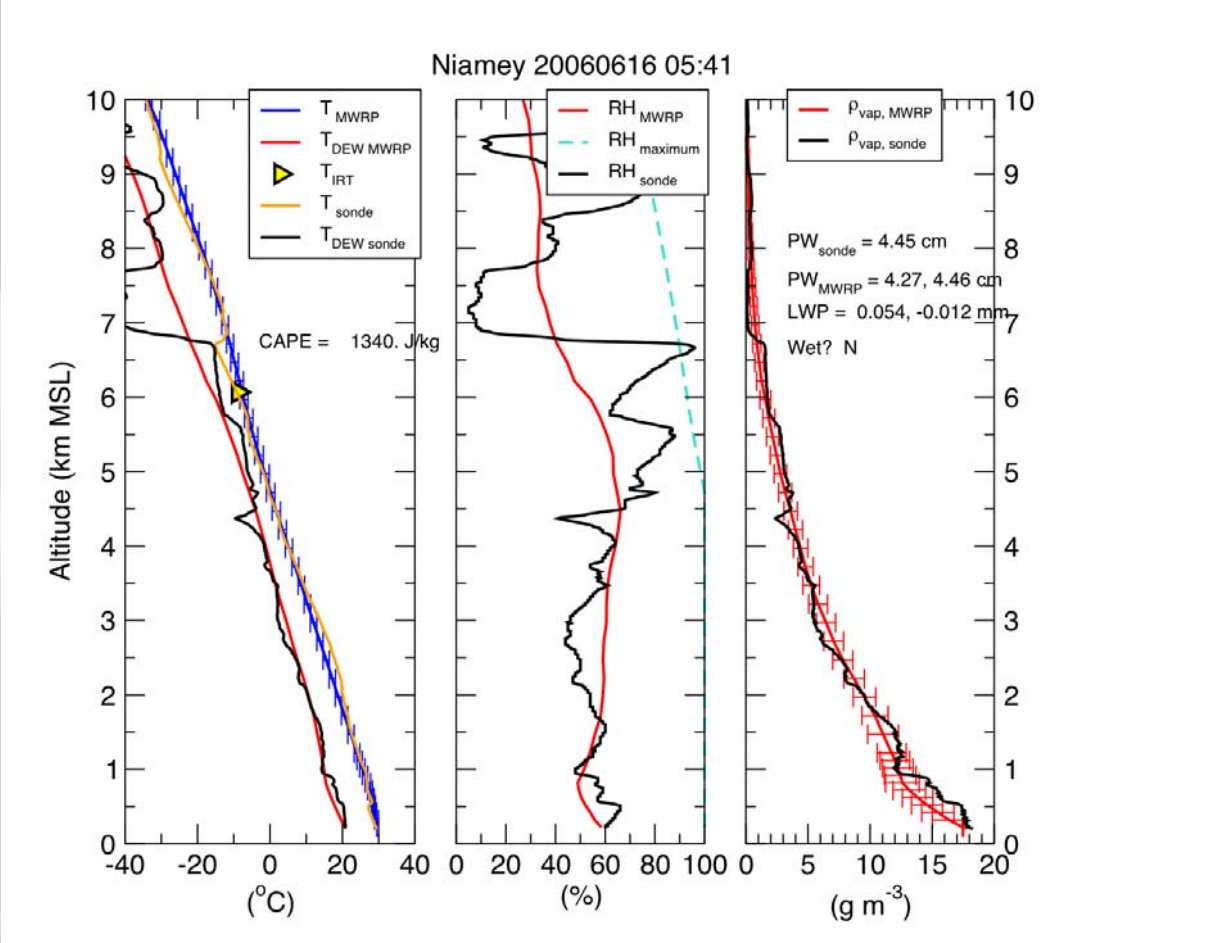
Temperature Combined with GOES



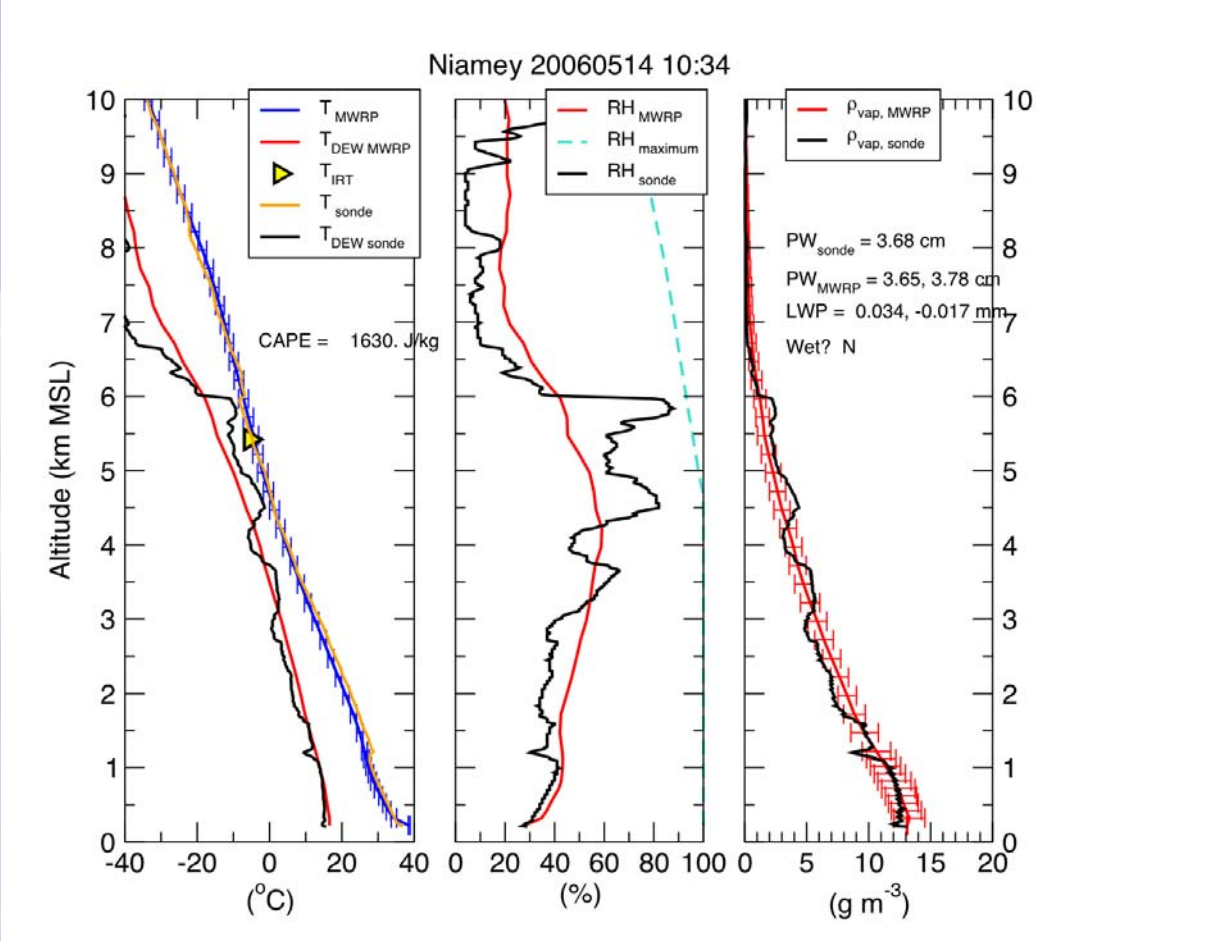
Water Vapor Combined with GOES



Comparison with Radiosonde



Comparison with Radiosonde



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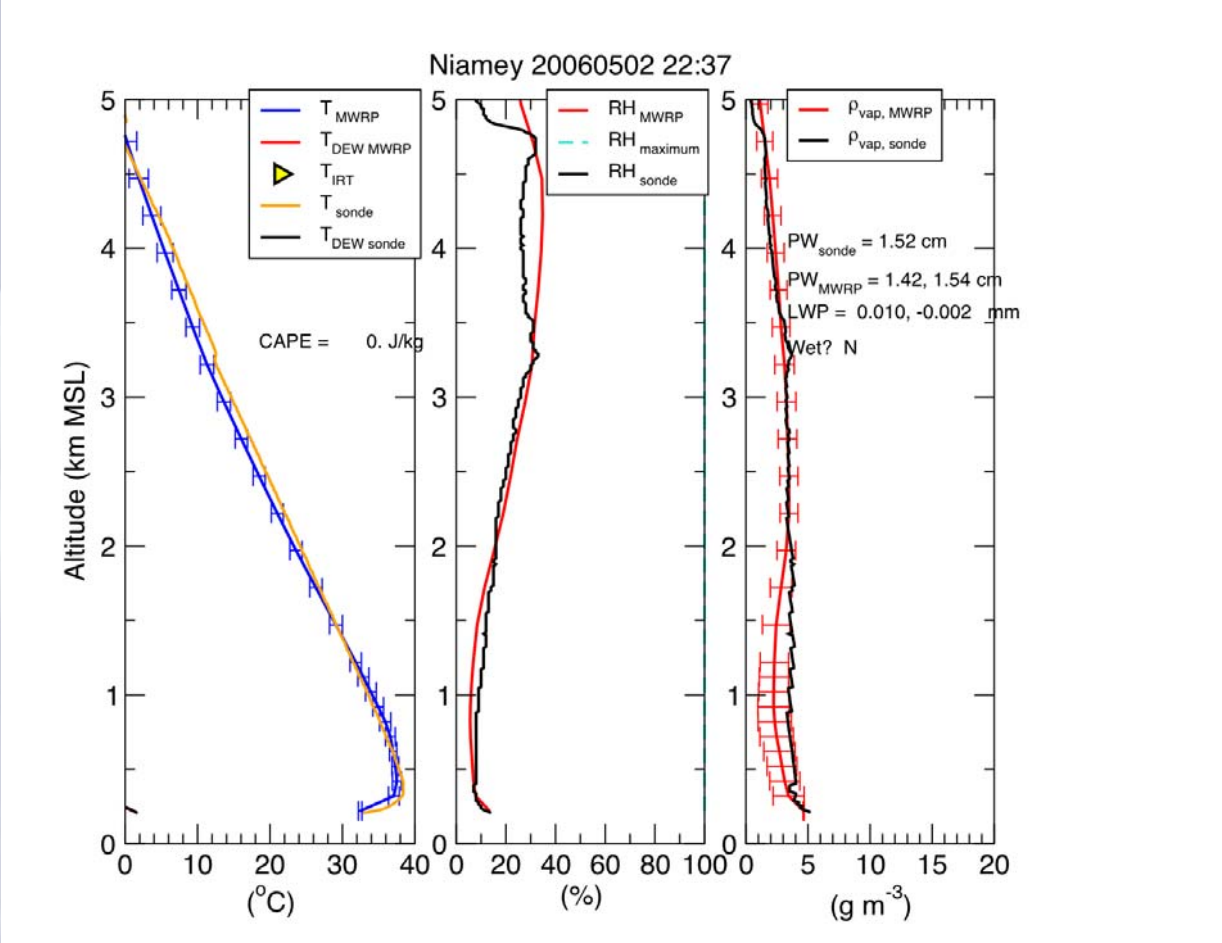
Comparison with Radiosonde



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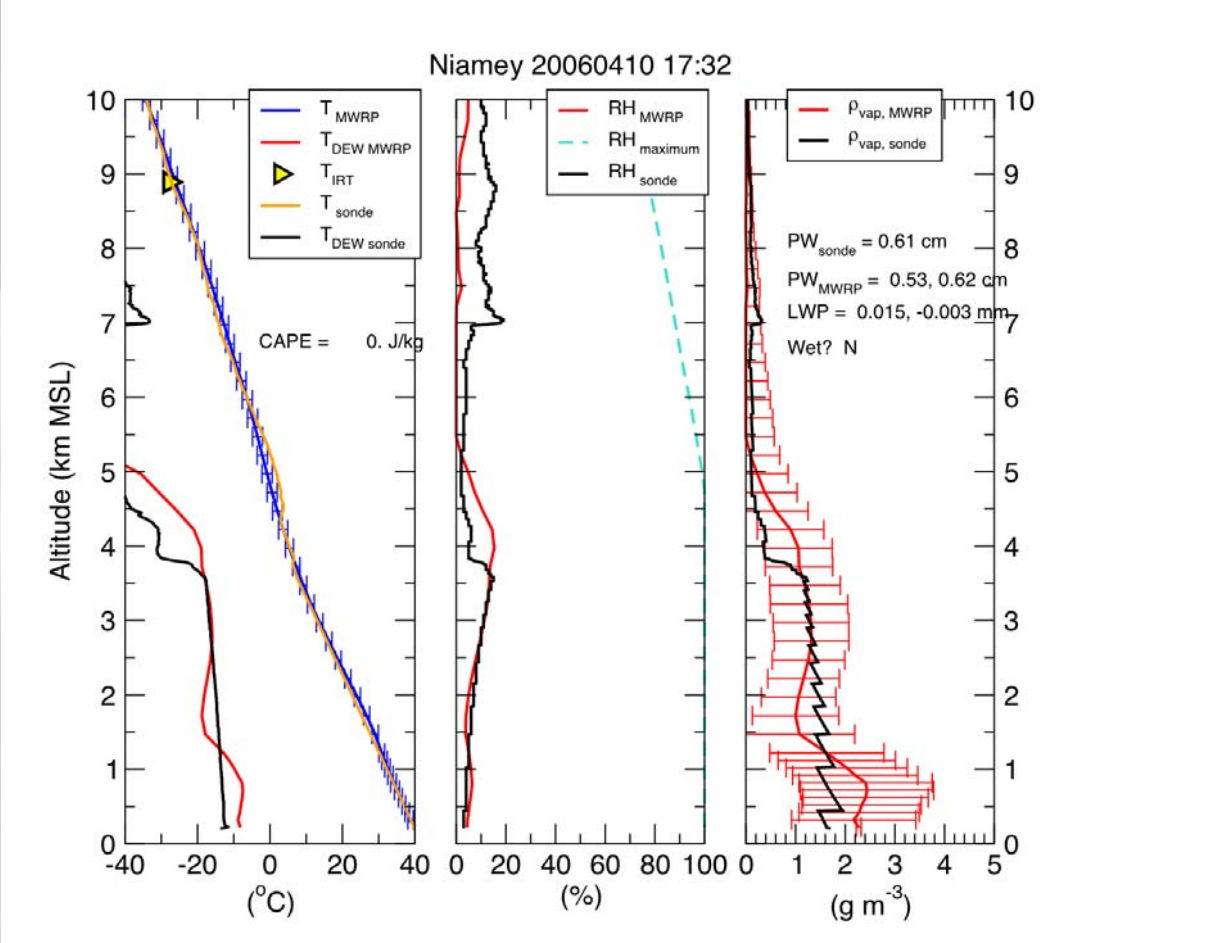
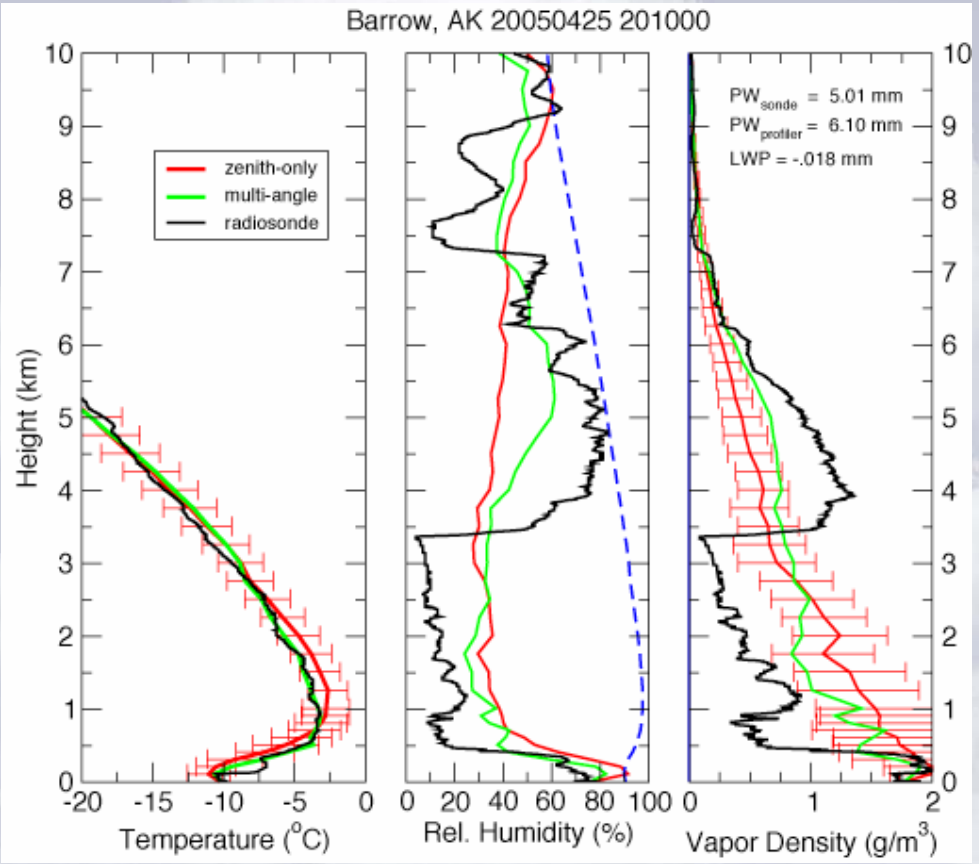
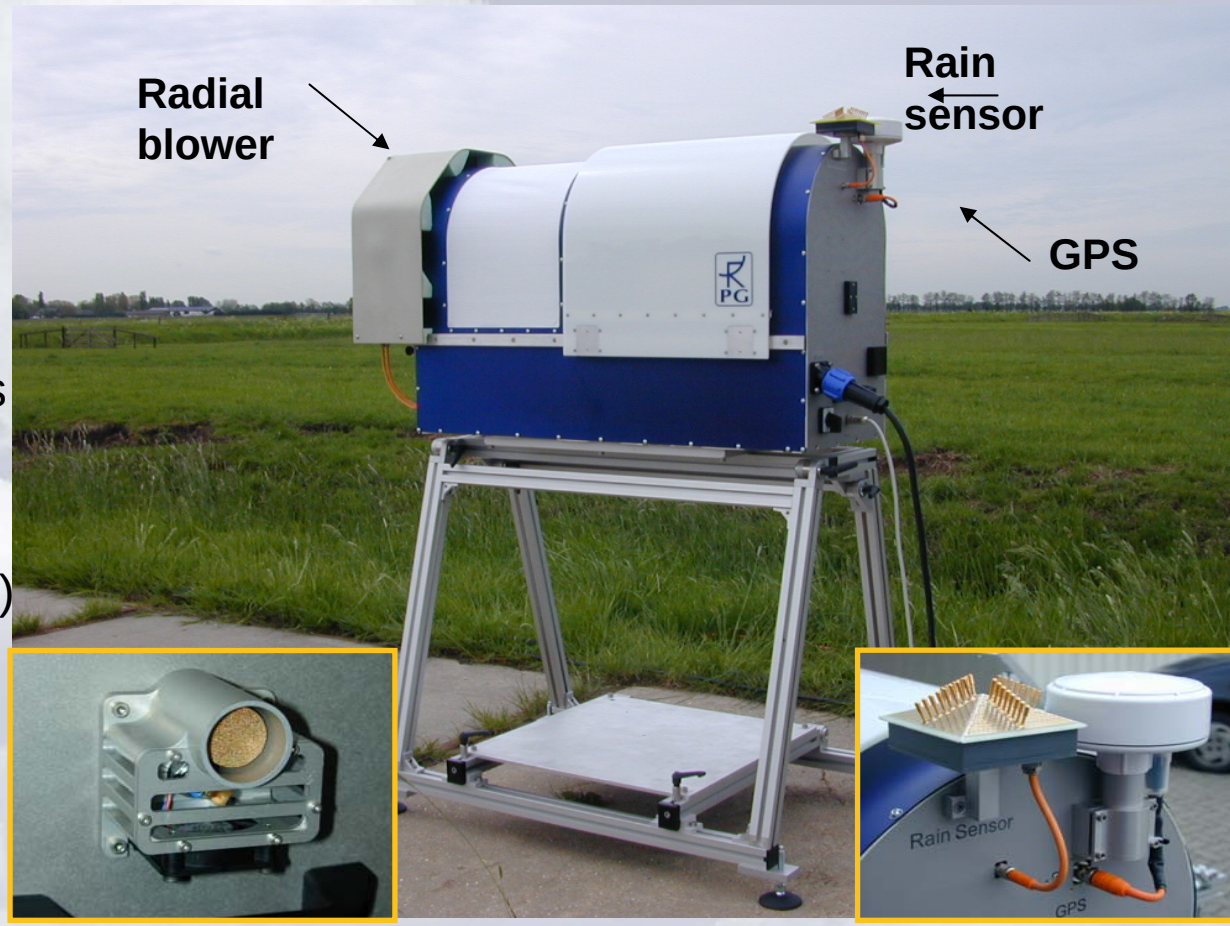


Multi-Angle Results



Humidity and Temperature Profiler (HATPRO)

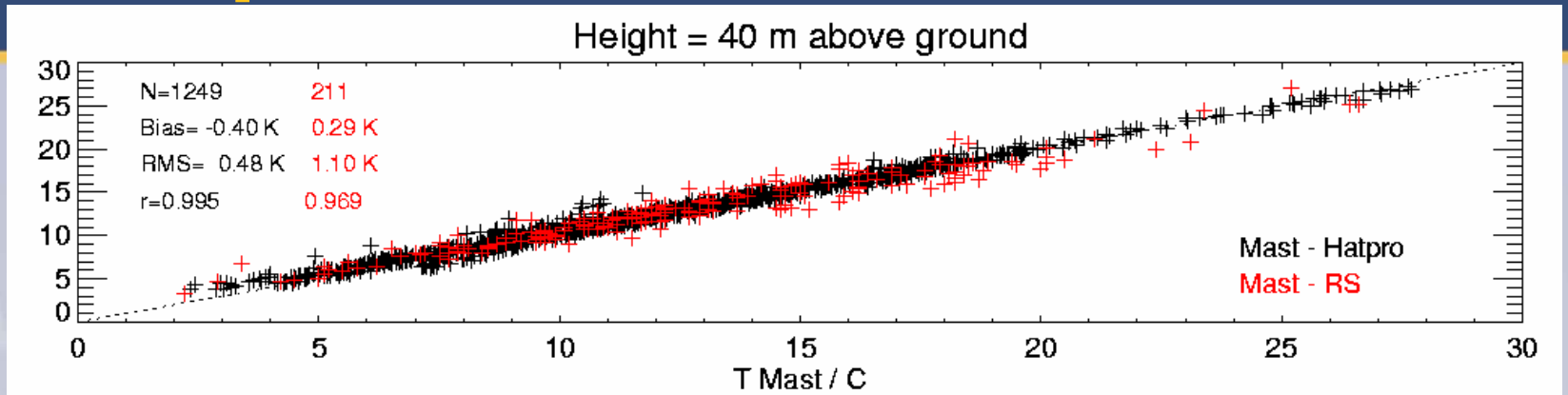
- Design based on BBC results
- suitable for **LWP** & **IWV** as well as **humidity** & (**boundary layer**) **temperature profile**
- rain sensor, GPS, clock
- environmental humidity, pressure and temperature

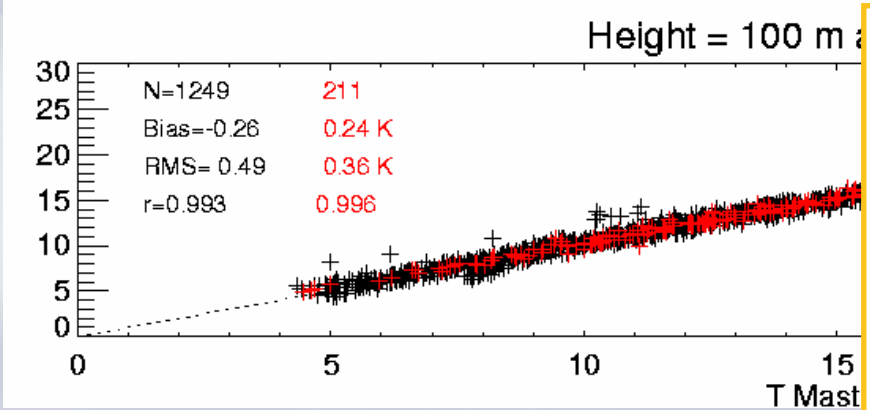


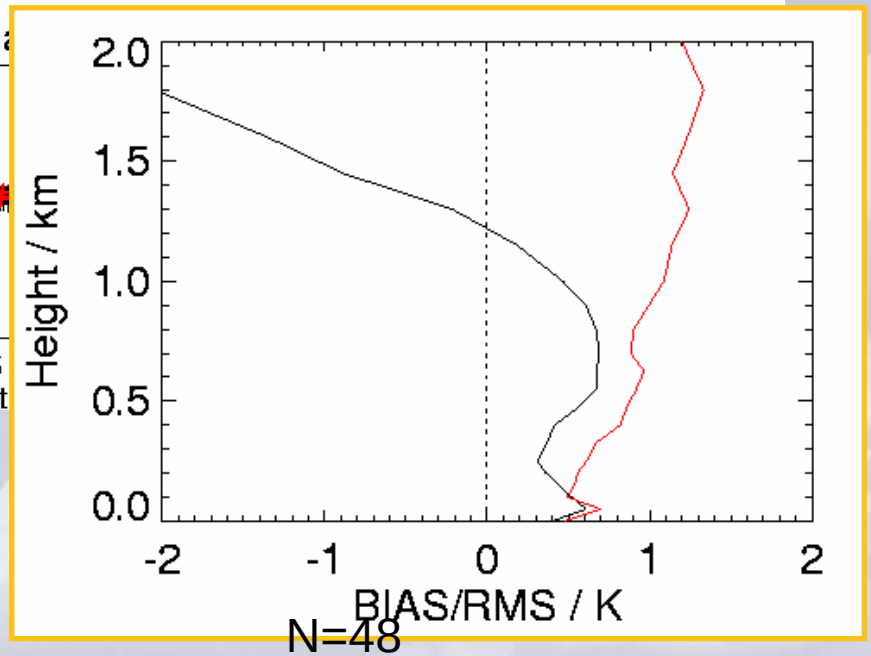
Radiometer Physics GmbH, Meckenheim

Courtesy of Susanne Crewell

Comparison with Tower, Radiosonde







N=48

- RMS between Radisonde & HATPRO lower than 1 K below 1 km
- slightly depends on wind direction
- lower inversion strength of is well detected
- 6 angle retrieval performs much better than 5

Bias RMS