WMO/IOC/UNEP/ICSU
GLOBAL CLIMATE OBSERVING SYSTEM (GCOS)

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2nd GRUAN Implementation-Coordination Meeting (ICM-2)
Payerne, Switzerland
2-4 March 2010

Item 7.2.1

Site report: Beltsville, USA

(Submitted by Belay Demoz)

Summary and Purpose of Document

This document contains an overview of the measurement programme at the Beltsville site with respect to GRUAN requirements, and addresses the questions to be discussed in this session.

HU-Beltsville GRUAN site

Presented by Belay Demoz

Contributions: E. Joseph, D. Venable, D. Whiteman, M. Adam, B. Gentry, H. Chen, K. Vermeesch, T. Bacha,

Content:

1. Response to GRUAN questions
2. Update on activities – wind and NDACC activities
3. Discussion and conclusion

Acknowledgment: NASA/GSFC, NASA/HQ/SMD/NWS, NCAS

1. Which of your existing radiosonde launches already meet the mandatory requirements (GCOS 121: once weekly best production quality radiosonde, once monthly stratospheric water vapour; recommended twice daily), and which additional launches need to be instigated or augmented?

Once Weekly:

– Vaisala RS92

– *In collaboration with NASA*, we can launch CFH , and we plan on redundancy.

Twice daily launches.

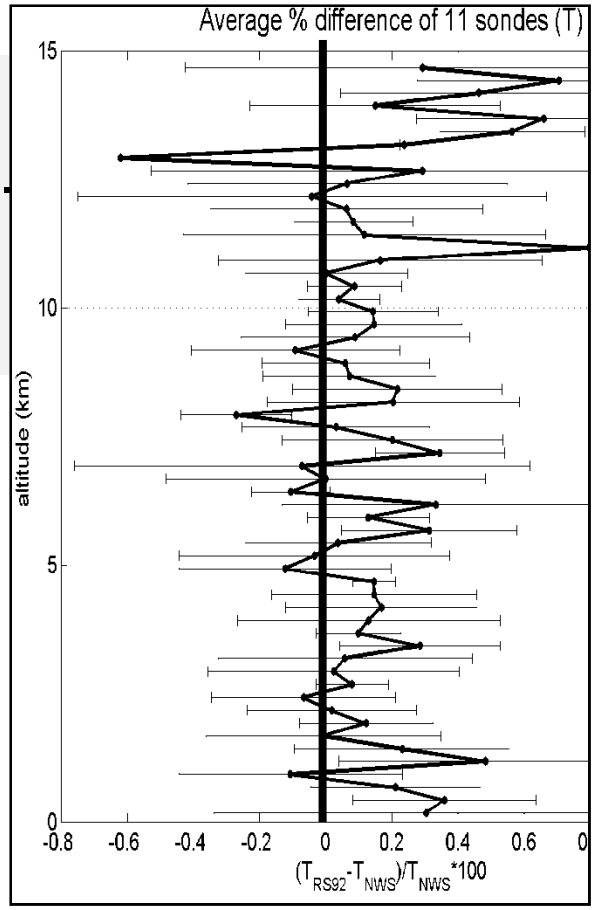
- Possible but … resources.

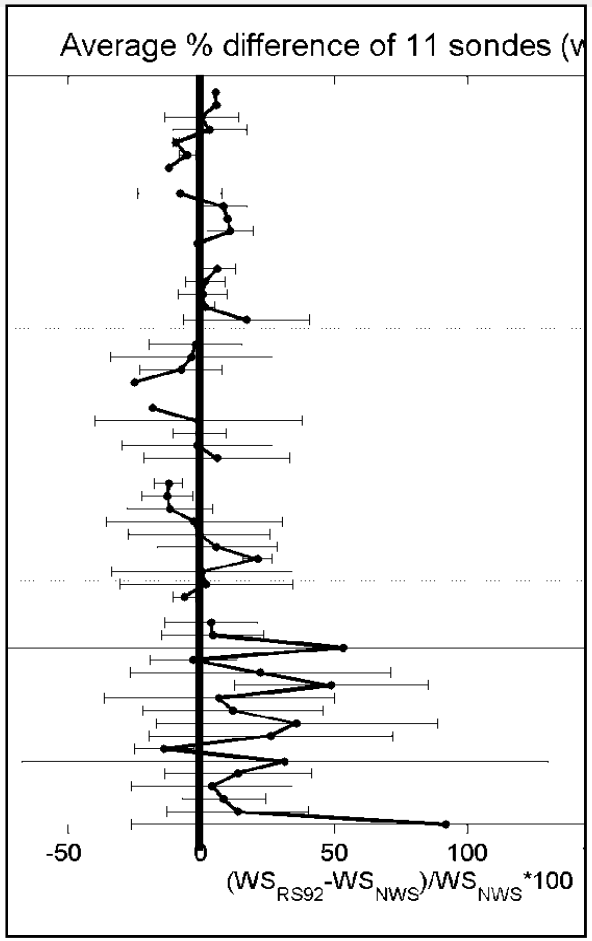
- Proximity to IAD/NWS (GCOS site)

Temp/Wind Speed.

- <0.4% change in T

- < 10% in PBL Ws





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Once Weekly:

– Vaisala RS92

– *In collaboration with NASA*, we can launch CFH , and we plan on redundancy.

Twice daily launches.

- Possible but tasking in resources.

- proximity to IAD/NWS (GCOS site) should be adequate.

Mixing ratio diff.

-Two different sensors (RRS/ RS92)

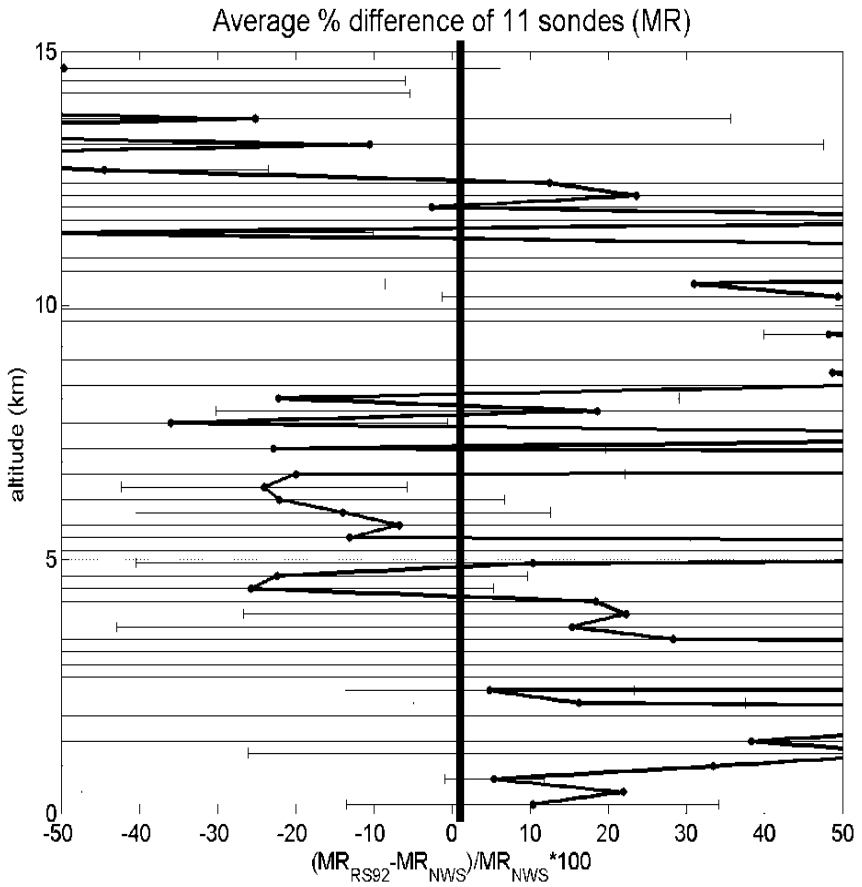
- Within an hours launch

- # of profiles

- averaging layers

- Is this regional?

-Will test this soon with RS92s



2. Which ground based measurements can you provide in addition to the mandatory GPS total water vapour column (microwave, FTIR, lidar, …) and how can you use these additional observations to make sure that measurement uncertainty estimates will be consistent?

- 24/7 MWR-profiling (water vapor, liquid water, cloud base temperature)

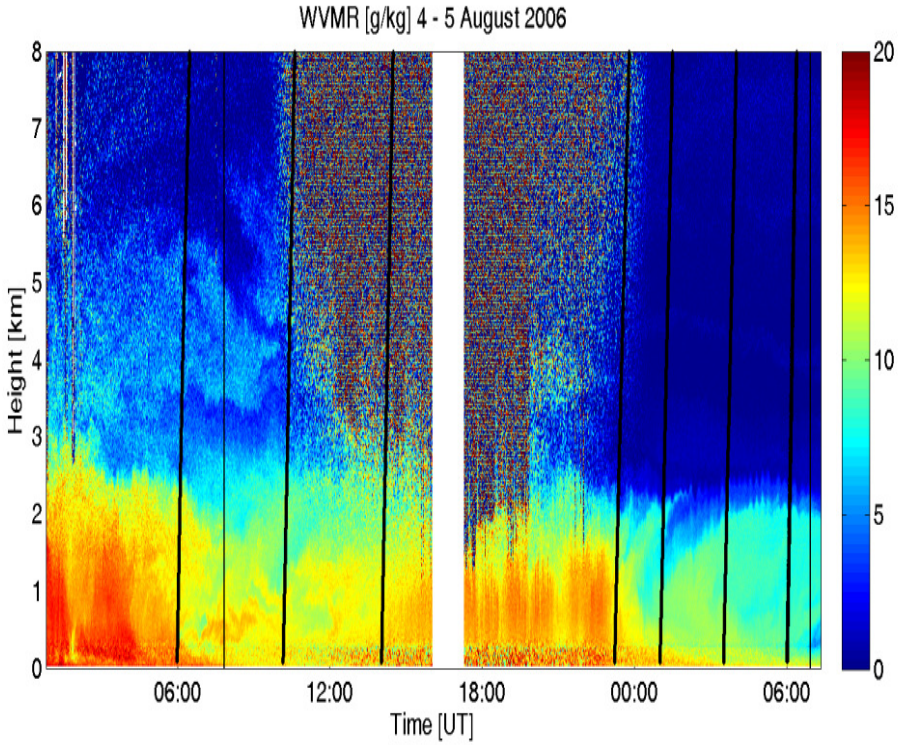
- MWR (IPW and ILW)

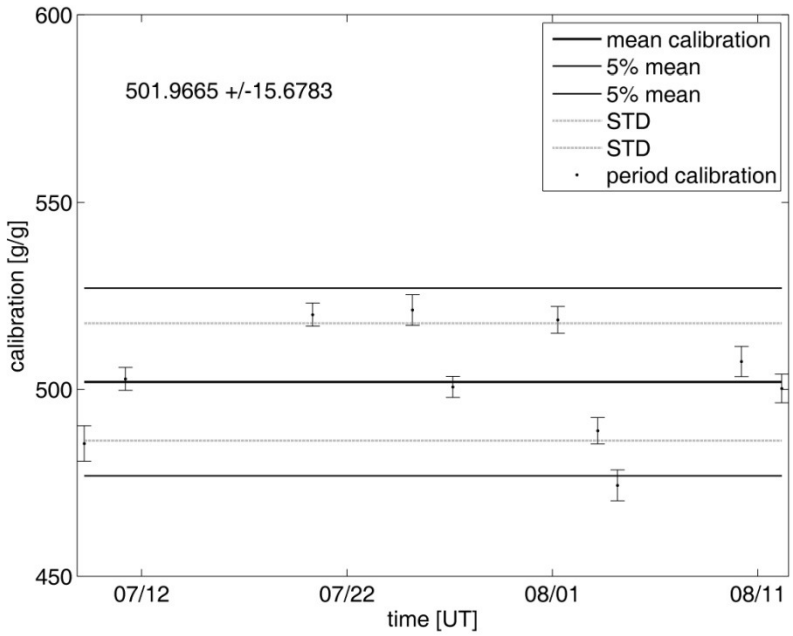
- Lidar (water vapor mixing ratio)**

Periodic comparison of

• IPW from radiosonde, GPS, MWR

• Consensus reference (Facundo et al. 2009)





Although we can provide mixing ratio and aerosol backscatter profiles from the Raman lidar, this is tasking to do with high frequency. It is manageable for weekly operation but not for daily work without significant resources.

2. Which ground based measurements can you provide in addition to the mandatory GPS total water vapour column (microwave, FTIR, lidar, …) and how can you use these additional observations to make sure that measurement uncertainty estimates will be consistent?

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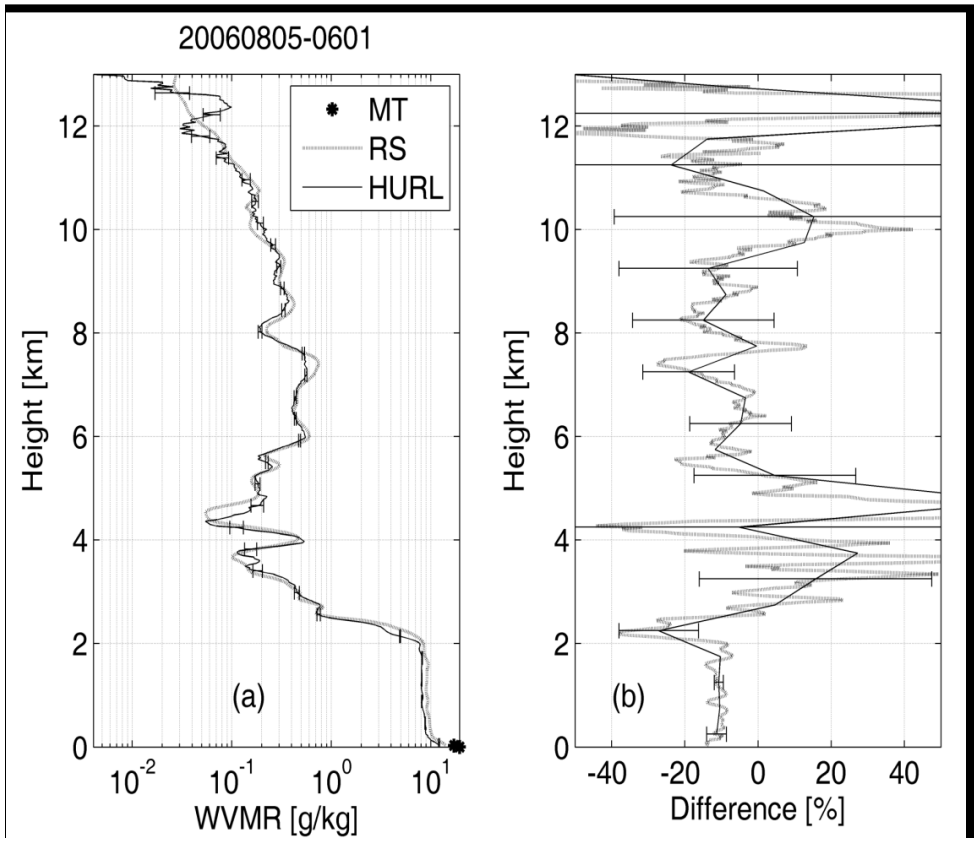
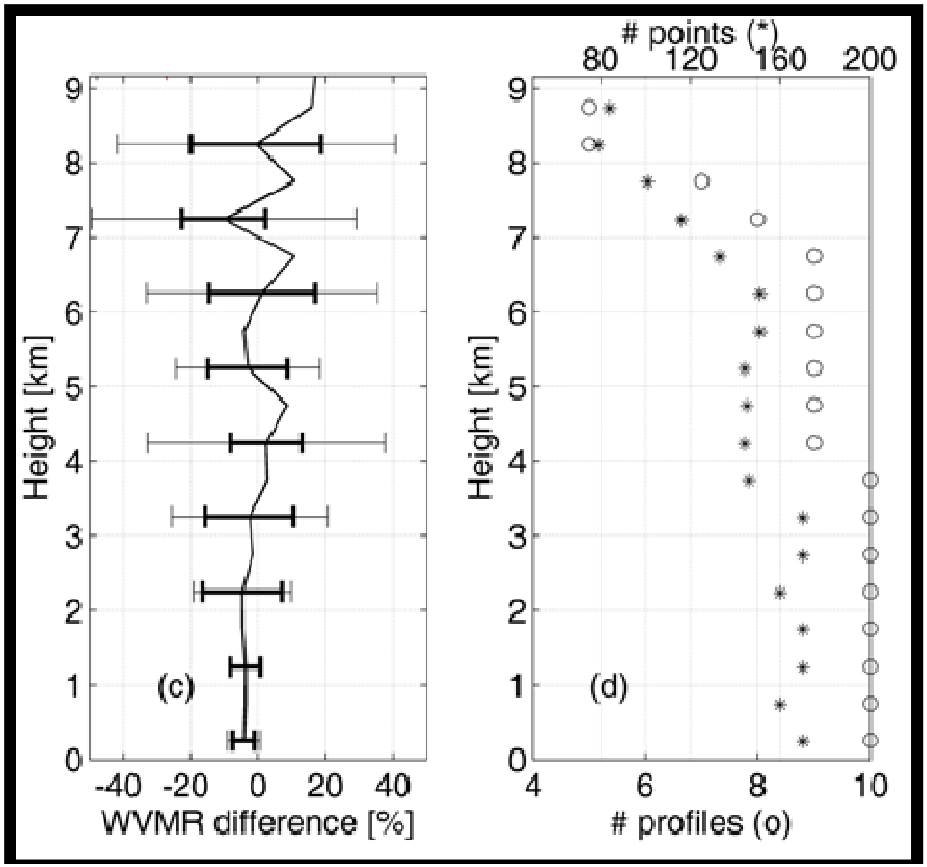




3. Do you have any limitations regarding the development of GRUAN launch protocols for routine and reference sonde launches (e.g. the use of autosonde launchers)?

No. Our limitation is resource. Autosonde launchers?

4. Do you have any limitations regarding the development of uniform GRUAN data processing schemes for remote sensing observations?

Not really, if the schemes are focused on the post processing data. If it requires modification of the instrument operating procedures, we need to discuss this with our partners.

6. For sonde observations: Can you provide all raw data for central archiving?

Yes.

7. For remote sensing observations: Will you be able to archive all raw data for possible future reanalysis and reprocessing?

This is instrument dependent and can be cumbersome. A better definition of "raw" instrument by instrument is required. As a rule we can share raw data that we save, but requires some uniform definition on what is meant by "raw."

8. What help do you need from the Lead Centre / WGARO/ GCOS Secretariat in moving forwards?

Requests have to be specific and less tasking.

9. Will you be able so host local intercomparison campaigns (yet to be scheduled)?

Yes. We have done this in the past and we can make it happen.

10. Are there any special infrastructure needs that should be addressed? As at ICM1, sites are encouraged to provide written reports by no later than three weeks prior to the meeting for dissemination to meeting participants.

The requests can only be met through cost sharing with existing funds. We need to identify a source for augmentation of operational funds for GRUAN.

5. What local analysis can you provide to assure that measurements uncertainties will be consistent across the network (Analysis of redundant observations either dual sonde launches or sonde + remote sensing observations)?

Multi sonde launches:

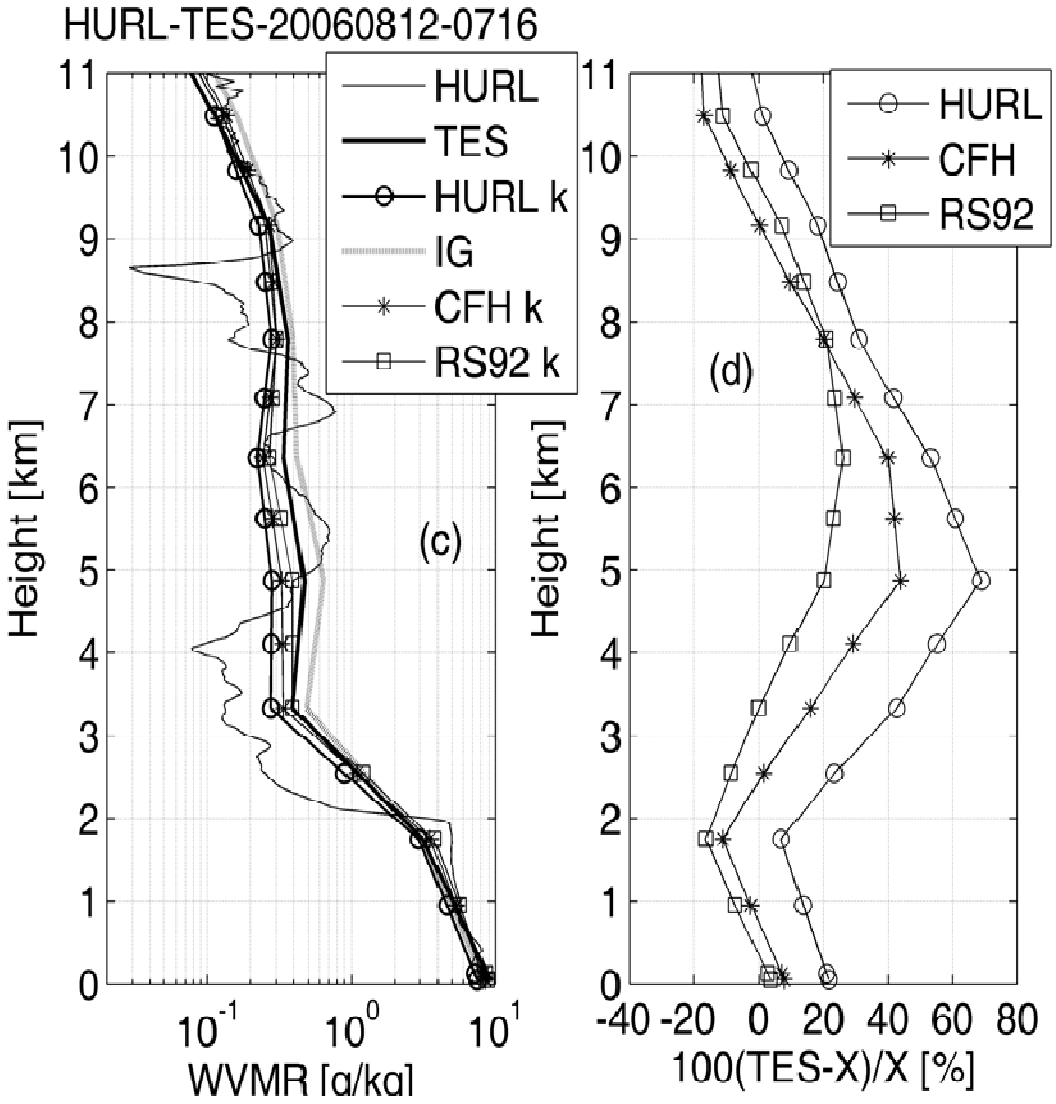
- *periodic launches of iMet, Modem, RS92*
- *possible dual launch of RS92*

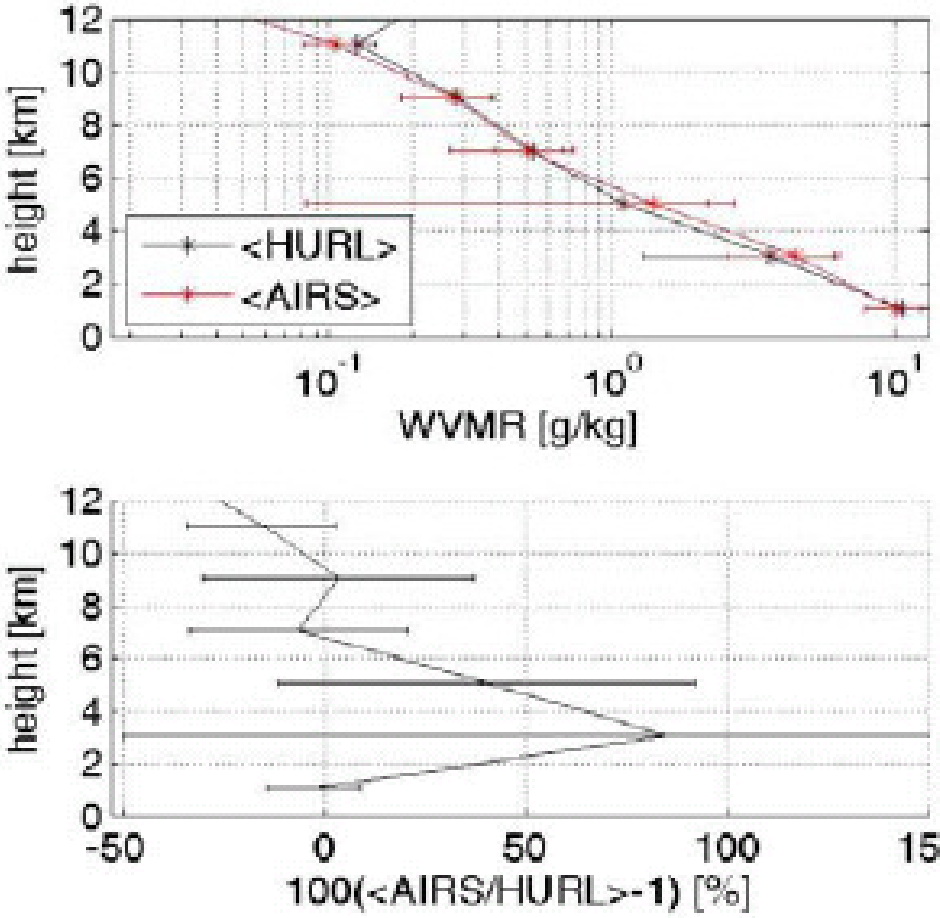
Sonde + remote sensing:

- **Periodic lidar, MWR, GPS, sonde analysis**

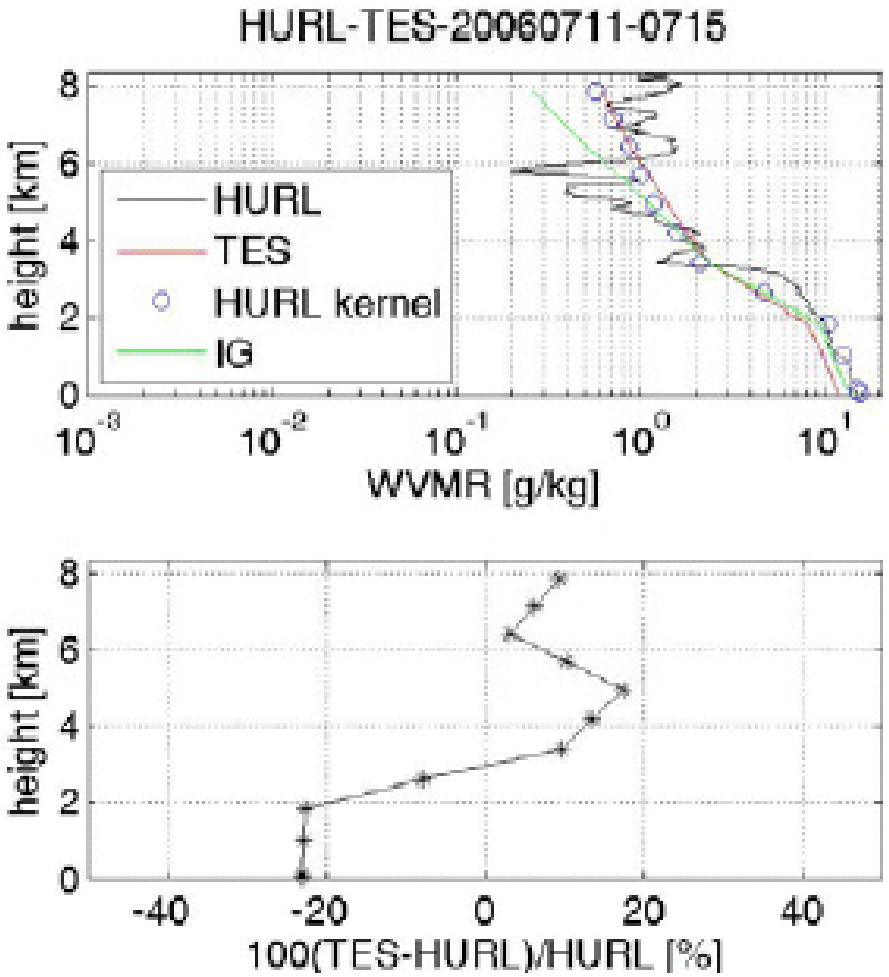
Sippican (LMS; - near future)

- *allows for multi-thermistor temp.*
- *snowhite sonde launches*





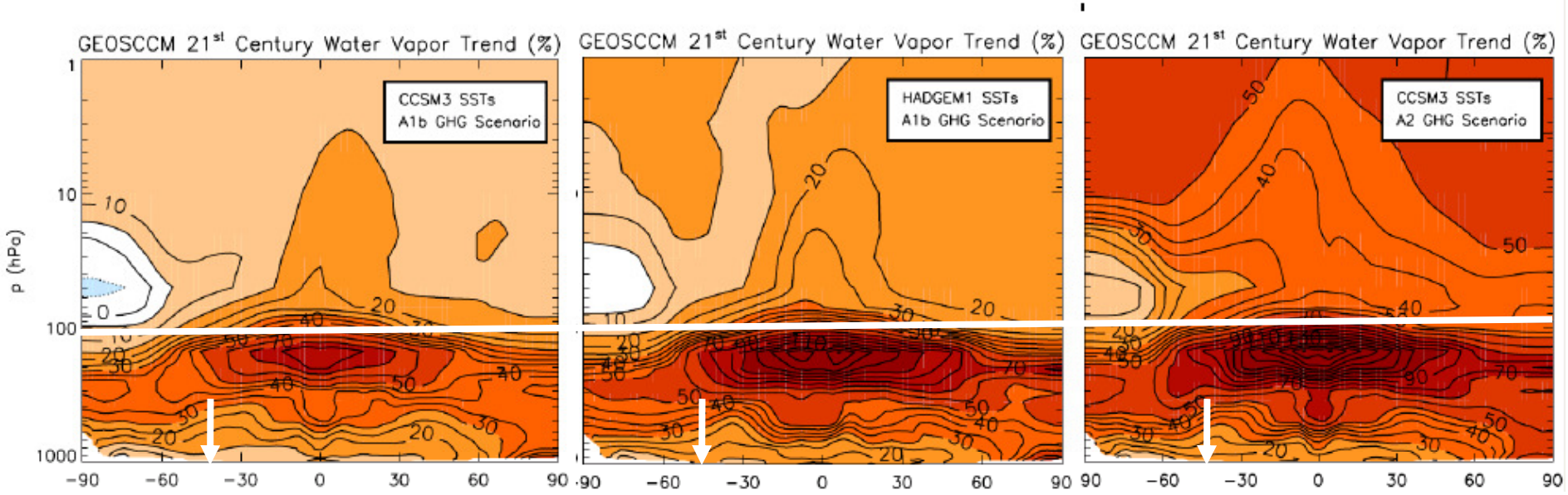
Water vapor mixing ratio ensemble averaging over all 6 night-time cases. The lower plot represents the relative difference with respect to HURL. The results shown are for 2 km layers.



HURL-TES water vapor mixing ratio for July 11, 2006, Aqua overpass 07:15UT. The lower plots represent the relative difference with respect to HURL after applying *a priori profile and kernels.*

NASA/GSFC Collaboration:

Whiteman et al. 2010 see *http://ams.confex.com/ams/90annual/techprogram/paper_161597.htm*



Number of Years to Detect Trends Using Two Different Sensors		
Measurement Frequency	10% sensor	GRUAN required sensor
Daily	19	18
Every 4 days	24	22
Monthly	39	36

- *Beltsville is at 40N and SGP is at 36N*
- *10hPa ~ 16km*

Implications for GRUAN?

- Cost/benefit on frequency
- Station locations etc
  - equatorial
- Instrument mix
  - e.g. Lidar+sonde