Howard University – Beltsville Site Report

5th GRUAN Implementation-Coordination Meeting
De Bilt, Netherlands
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Students

Acknowledgment:
NASA, NOAA, NOAA/NCDC; NOAA Center for Atmospheric Studies

Summary of activities

Beltsville Sounding Data, 2012 Statistics.

- RS92 soundings: RS92 ➔ *>1/week continues*
- ozone soundings: EN-SCI ➔ ~ 1/month
- RSLAUNCH - ***In progress*** (*plan to put all retroactively*)

Soon to start:

- CFH: Periodic launches continue
- NOAA/NASA funding will allow for 1/month with lidar support.
    - Nighttime (~ Whiteman and Venable)

NWS/Sterling-Beltsville Collaboration

- More focused on ceilometer network expansion
- New DIAL water vapor testing.

NOAA/STAR Collaborations

- Soundings are targeted for NPP nighttime overpass.
- supported by Lidar/MWR etc (SASBE??)

Other: Involved in GATANDOR, Trend analysis, others tasks, WCRP etc.

Examples of ***student*** projects that could benefit GRUAN

Update-1: Raman Lidar Calibration+

Motivation: ***(Student project)***

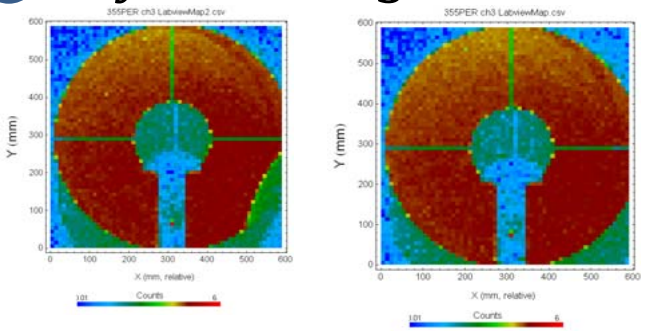
- **As GRUAN moves forward with Raman lidar mixing ratio profile product, documenting the state of optics, calibration, etc becomes paramount.**
- **How can measurements of lidar (Raman) water vapor (GRUAN priority-2 product?) from different instruments be compared?**
- **GCOS112: A roving Raman lidar as a calibrator** ***(Cost, feasibility)***

➔ ***Lamp Mapping Technique*** **– Use of a Scanning Standard Lamp Technique for Direct determination of Water Vapor Mixing Ratio Calibration Factor and more!**

Lamp Mapping Technique (LMT)

A standard lamp is scanned across the aperture of the Lidar telescope. Signals received in *wv* and N_2 channels contain information for system diagnostics and calibration.

- *System Diagnostics*



Vignetting *Aligned*

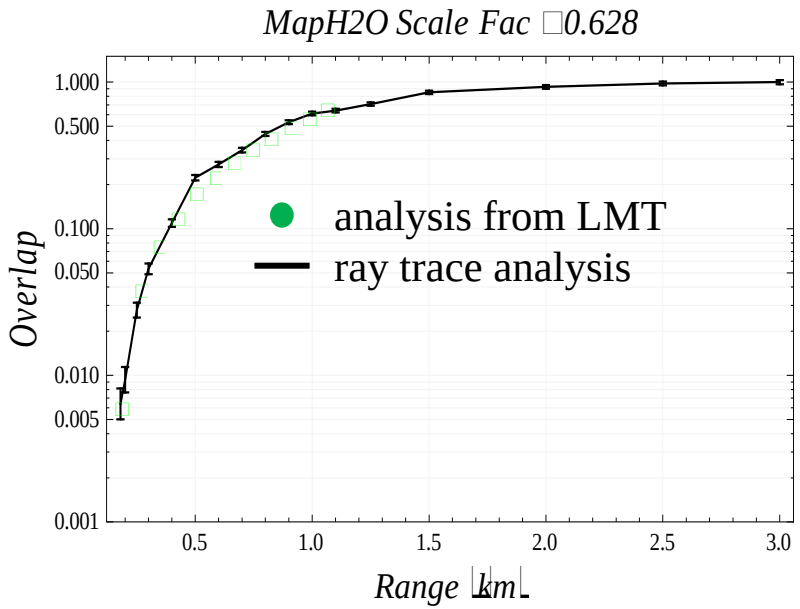
- *Glue Coefficients: PC=m AD*

Ch	LMT (10^{10} Hz/V)	Traditional (10^{10} Hz/V)	Diff (%)
N_2	9.59±0.30	9.51±0.03	0.84
wv	10.6±0.2	10.5±0.01	0.95

- *WV Mixing Ratio Calibration, radiosonde (RS) and LMT*

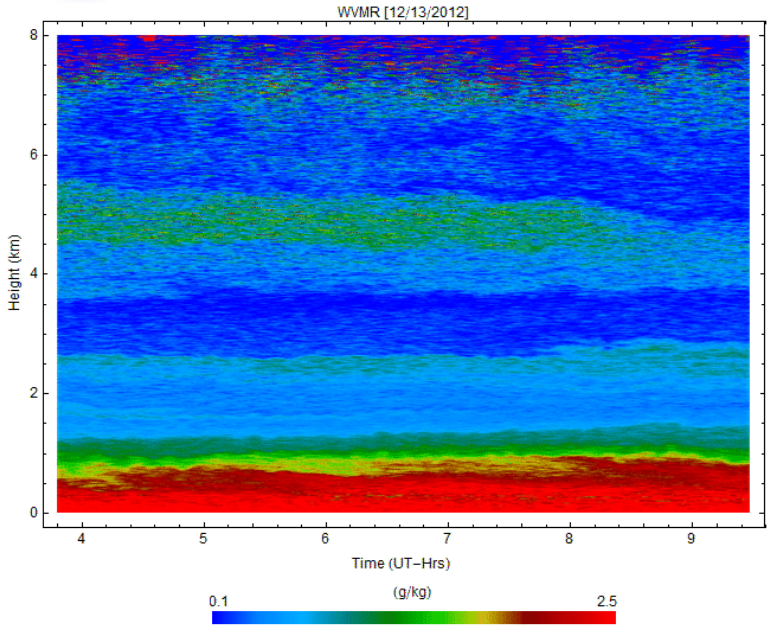
$$\left|\left(C_{LMT}-C_{RS}\right)/C_{RS}\right| \leq 5\%$$

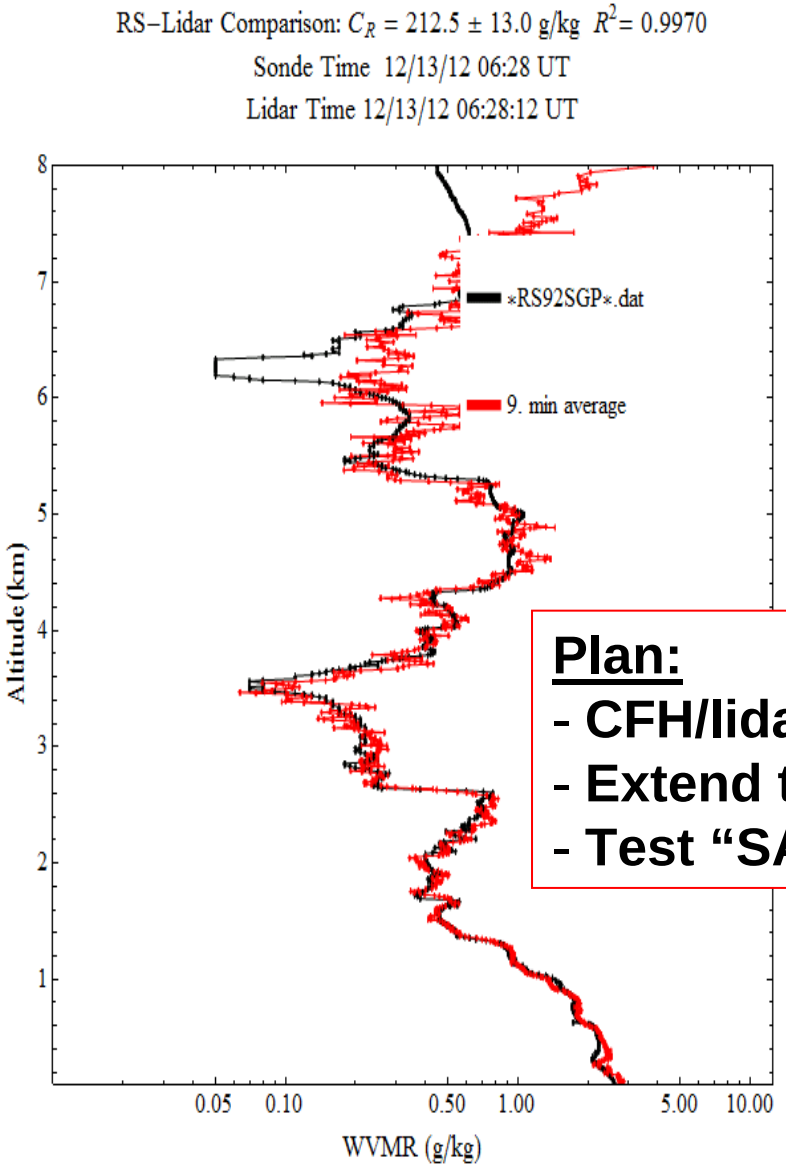
- *Channel Overlap Function- radial distribution of LMT data*



- *Technology is Transferable*

GRUAN Update-2: *Satellite Cal/Val (students launch)*





Current data:

A lot of redundancy

IPW: GPS/NOAA

MWR: 2 & 39(2) Channel

Sonde: RS92

Raman: HURL/ALVICE

Ozone: 1/month

Plan:

- CFH/lidar

- Extend to UT/LS

- Test "SASBE"

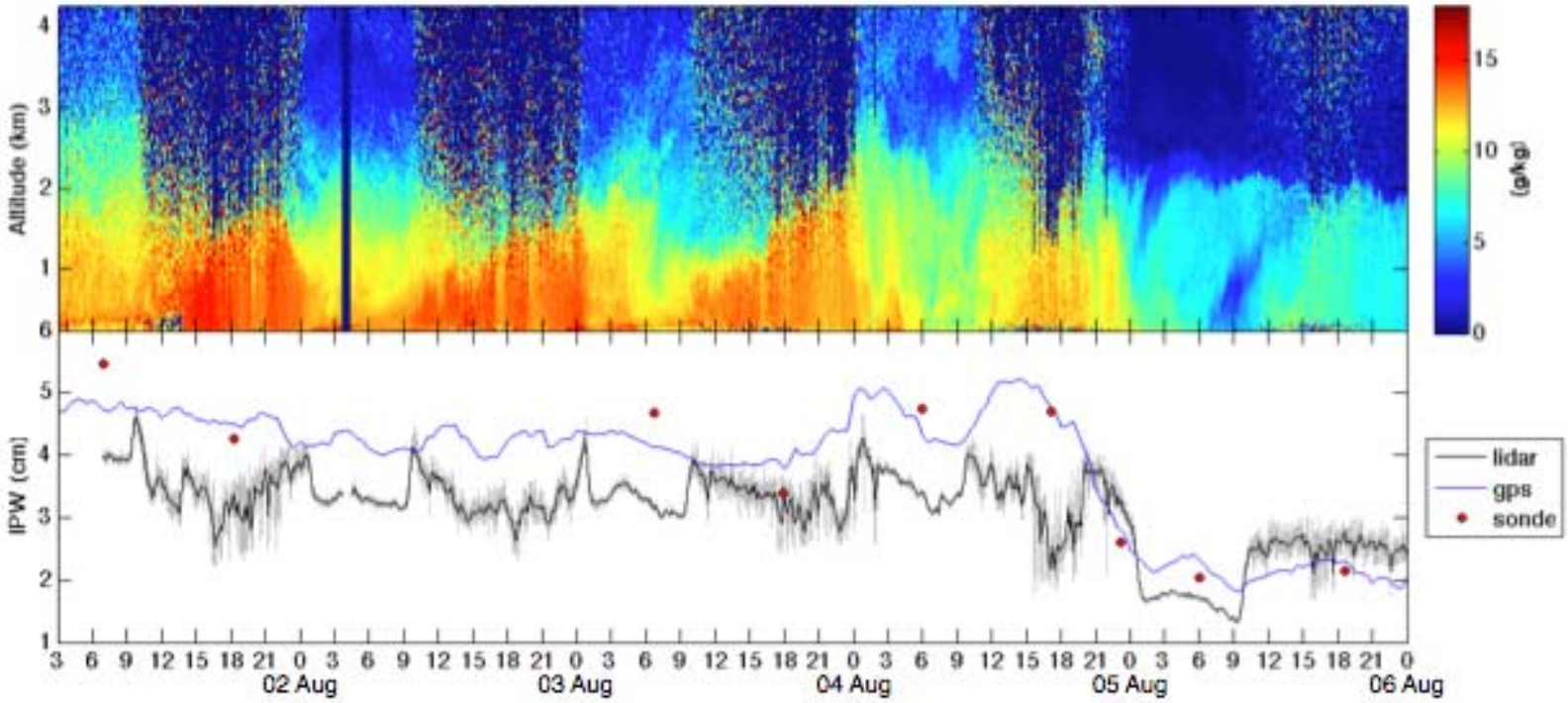
Update-3: *"Redundancy" – GATNDOR?*

Methods of using redundancy (Student project)

- *Overlapping coverage leads to instrument error characterization*
- *Data gaps filled*
- *Check calibration degradation*
- *Physics of retrieval: (e.g. MWR are very good in IPW but not so in profiling)*

Instrument	2009	2010	2011	2012	Freq.	WVMR Units
Vaisala RS-92	x	x	x	x	varying	g/kg
MP-3051A	x	x	x	x	2 min	NA*
MP-3089A				x	2 min	NA*
2-Channel MWR	x	x	x		2 min	NA*
NOAA—GPS	x	x	x		30 min	NA*
HURL			x		1 min	g/kg
NCAR DIAL				x	20 min	g/cm^3

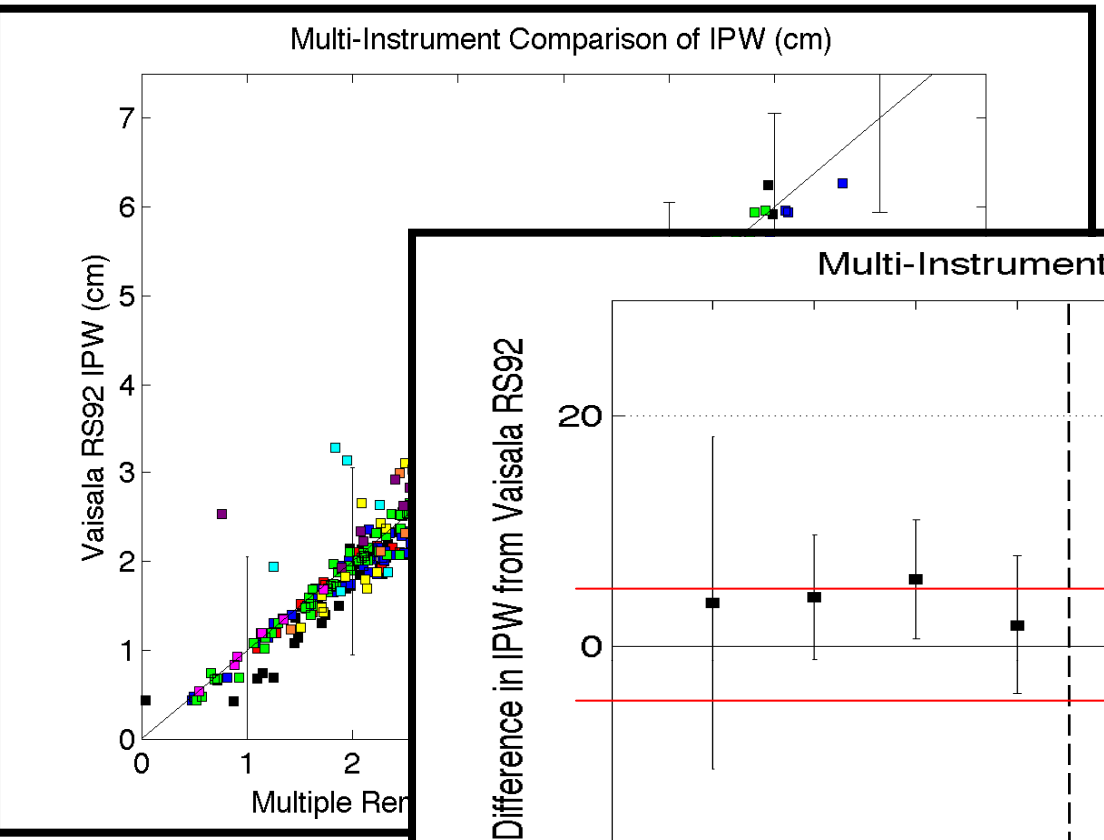
Update-3: *Redundancy*

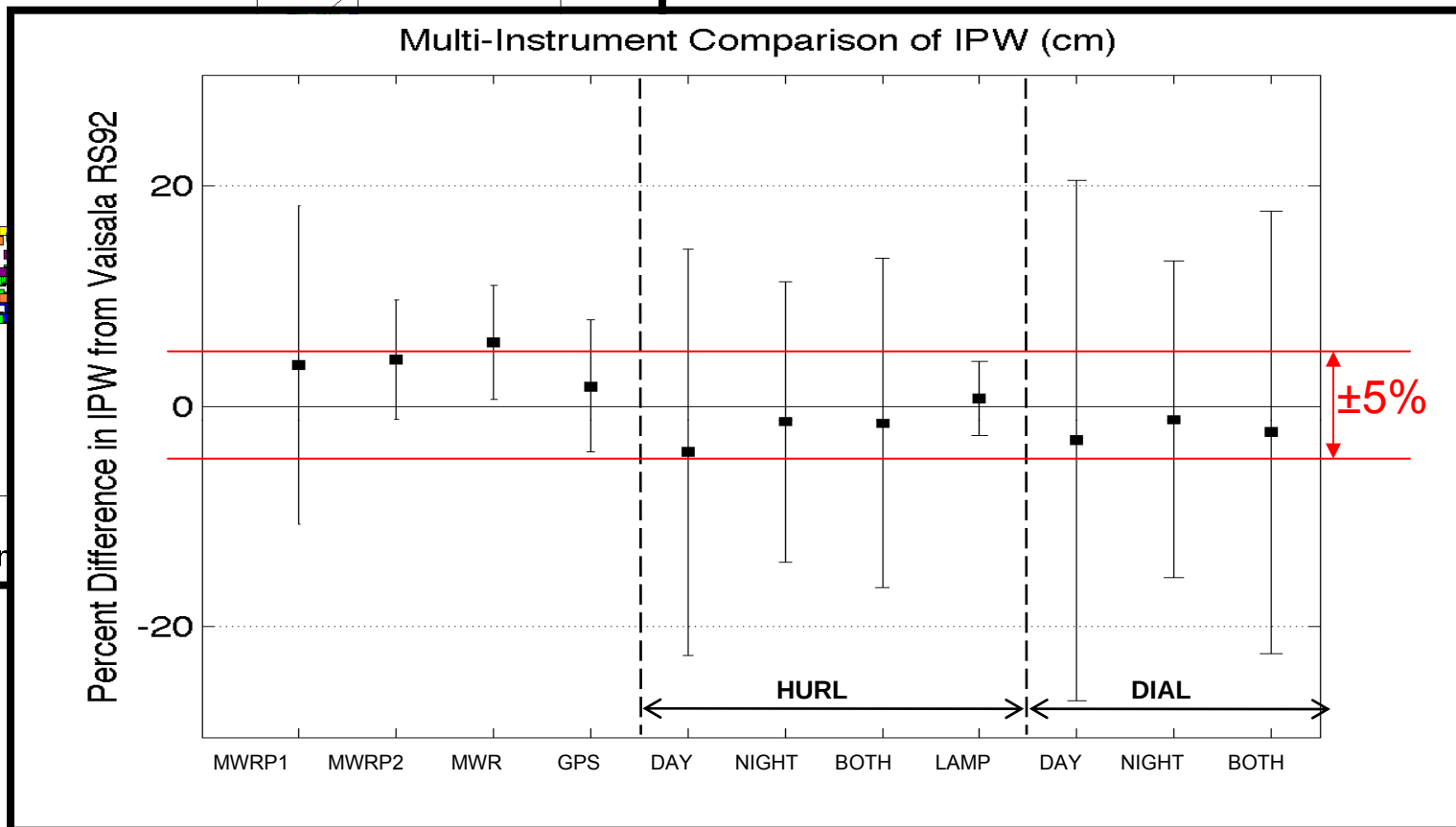


- Example: 1-5 August 2006 data
  - Issues with lidar calibration constant
  - Redundancy - we will use GPS to correct the lidar
  - We are looking at several IOP data like this to do the data check

Update-3: *Redundancy*

Preliminary evaluation of IPW instruments!



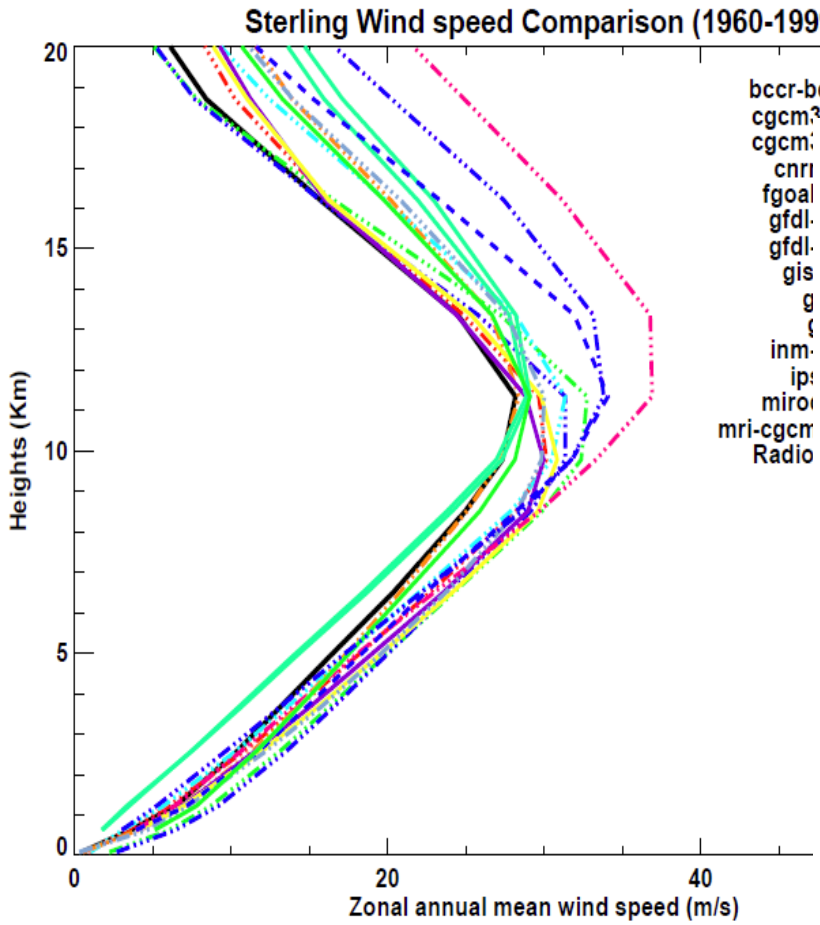


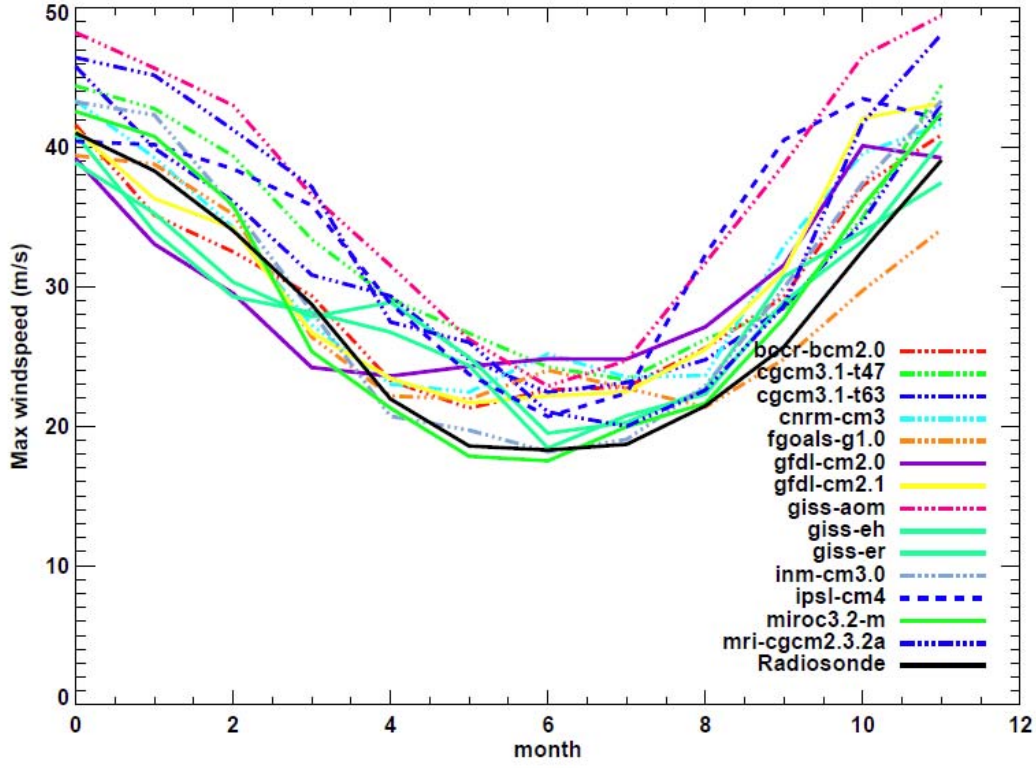
UPDATE-4: *Wind comparisons*

Wind – A forgotten priority-1 GRUAN variable? (Student project)

Analysis of multi-year wind trend data started.

Preliminary results include the following.

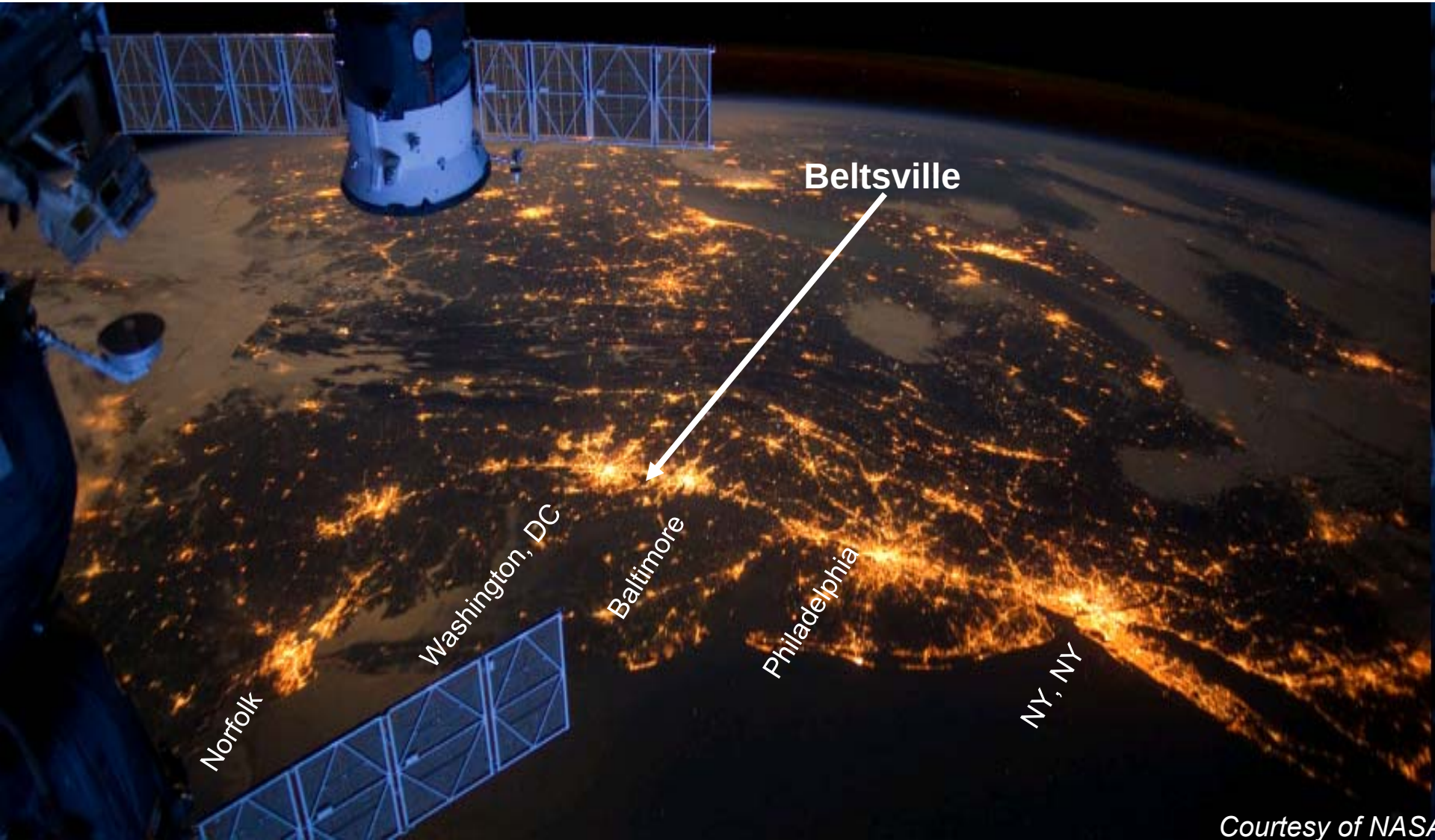




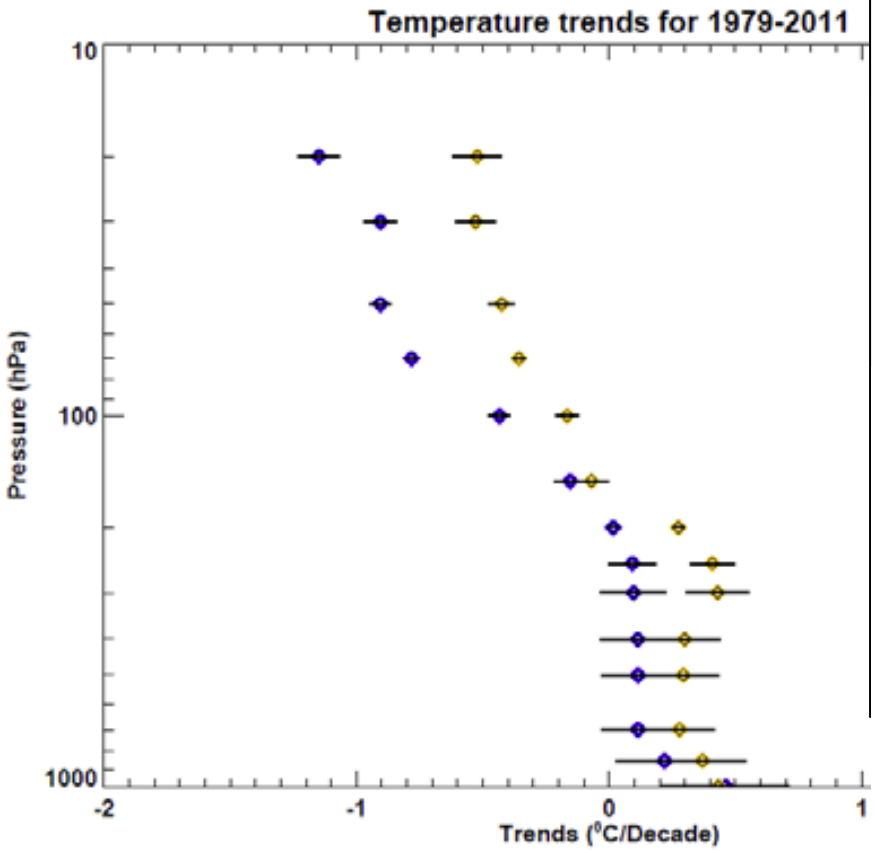
Summary:

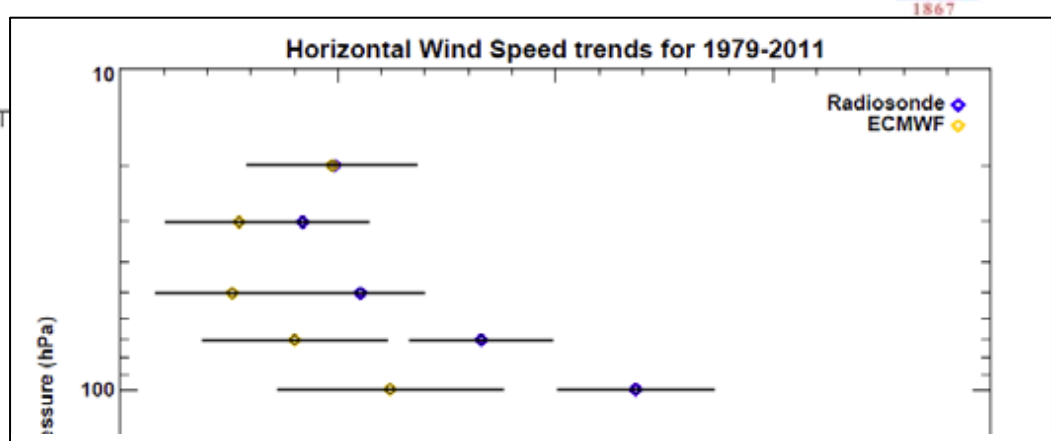
- we are launching 1xwk; + remote sensing+…
- data will be in GRUAN data stream soon
- most of the work is being done by ***students.***
- work that would could benefit GRUAN
- coordinated flight with NPP
- NIST tracable Raman Lidar Calibration tech.
- Contributing to other tasks.

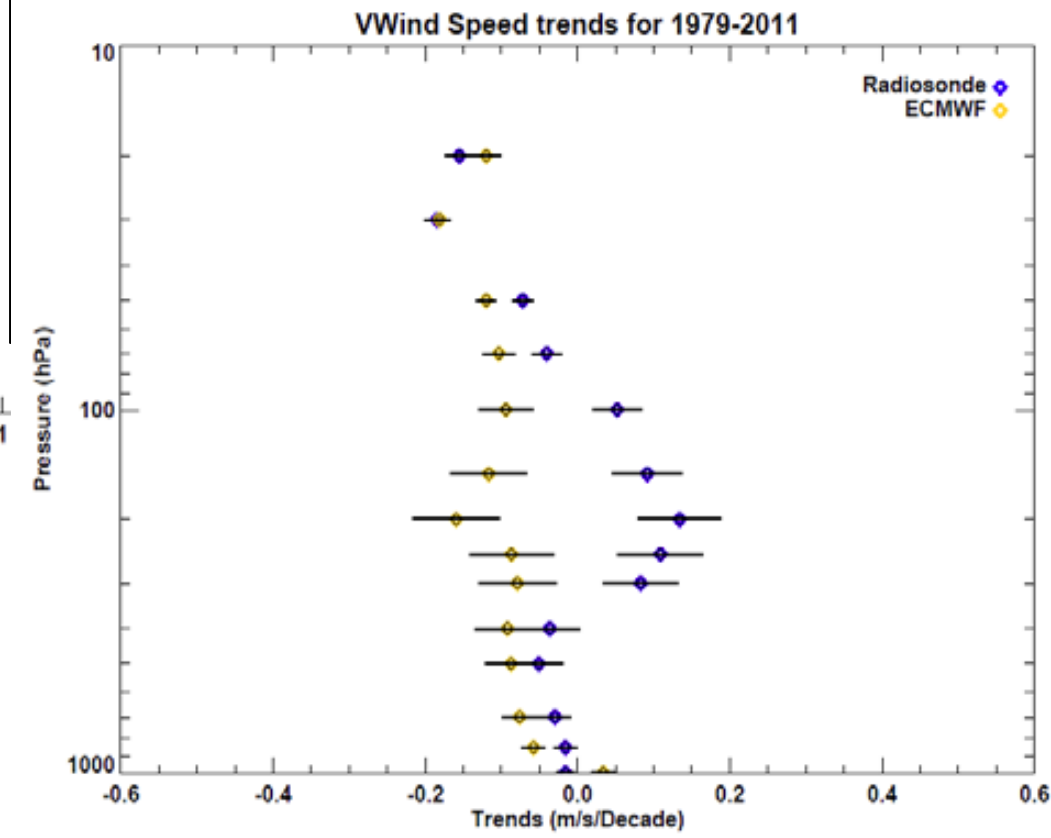
END – Beltsville Report



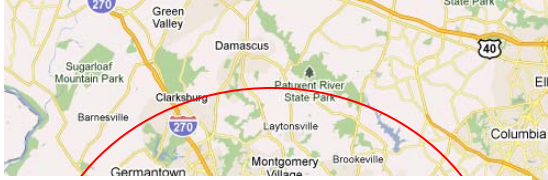
UPDATE: *Wind comparisons continues*





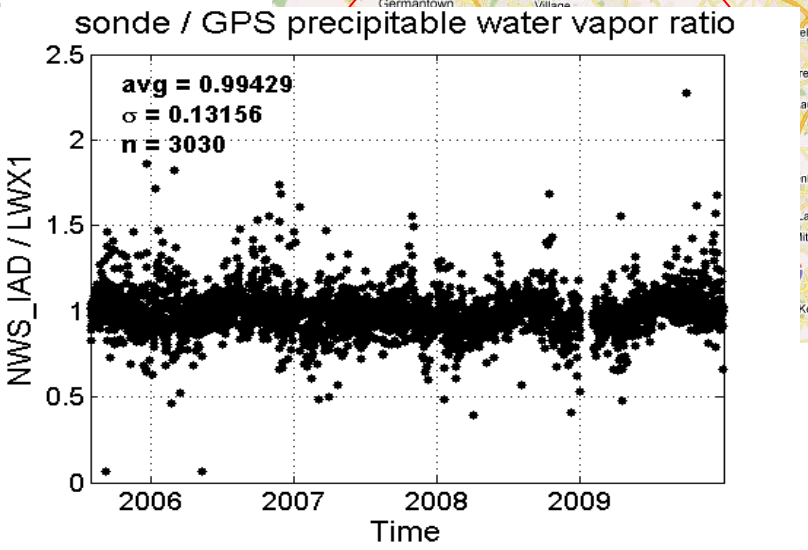


Sterling/NWS Vs Beltsville



IPW Comparisons

- **LWX1 (Sterling) Vs DCHU (Beltsville)**
  - ***GPS-Sonde variations at Sterling is comparable to the GPS-GPS variations for Beltsville-Sterling.***
  - ***GPS IPW may be used to scale mixing ratio profile variations.***



Ratio	LWX/ DCHU	RRS/ LWX	CFH/ DCHU	RS92Corr/ DCHU
Avg.	0.953	0.994	1.023	0.979
Std. Dev.	0.094	0.132	0.085	0.099
Pts.	5179	3030	18	119