NWS Sterling Field Support Center (SFSC)

Introducing GRUAN Mid-Atlantic Consortium (GMAC):

Vision, Composition, Current Activities, Plans

Presented by Belay B. Demoz & Dan Brewer

Howard University: Adrian Flores, R. Sakai, V. Morris, D. Whiteman

NOAA(STAR&NWS): T. Reale, N. Nalli, Bomin Sun, M. Hicks, J. Fitzigibbons, Peggy Hoch, Hiram Escabi, Jr.;

UMBC: B. Demoz, K. Vermeesch

Outline: *(two talks in one)*

Beltsville GRUAN Summary

(stat. new personnel, dual-sonde, CFH flights)

G-MAC: a consortium

Vision, composition, current activities

SFSC-Beltsville Coordination flights

SASBE – regional variability

GRUAN processing of AEROSE

NWS engagement in GRUAN

visit to LC and resulting work & update

Wallops multi-sonde deployment

Autosonde/Robosonde operational test activity

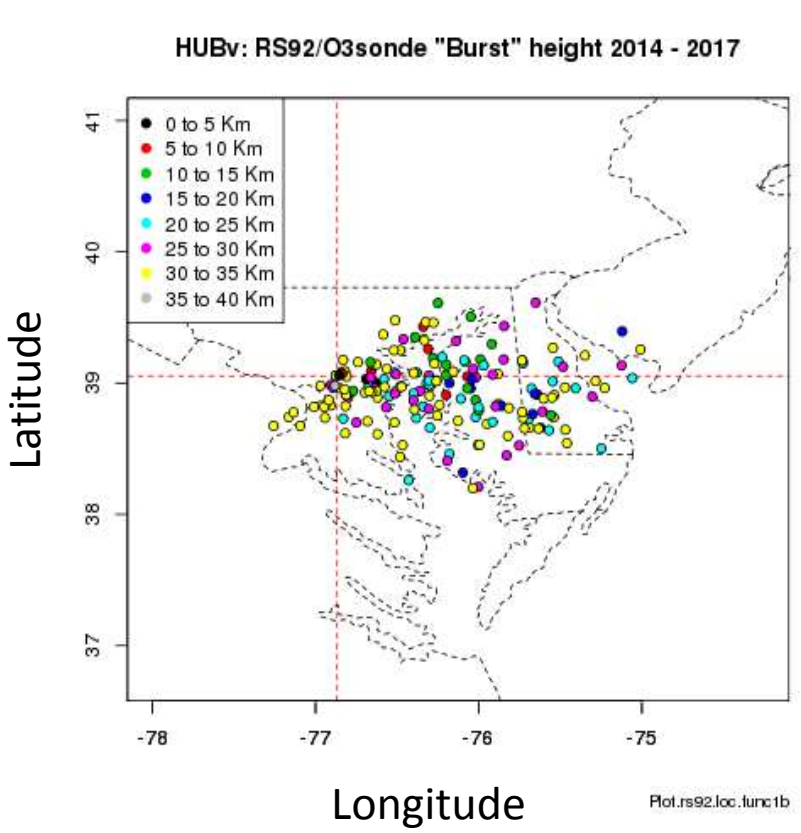
HUBC Stats

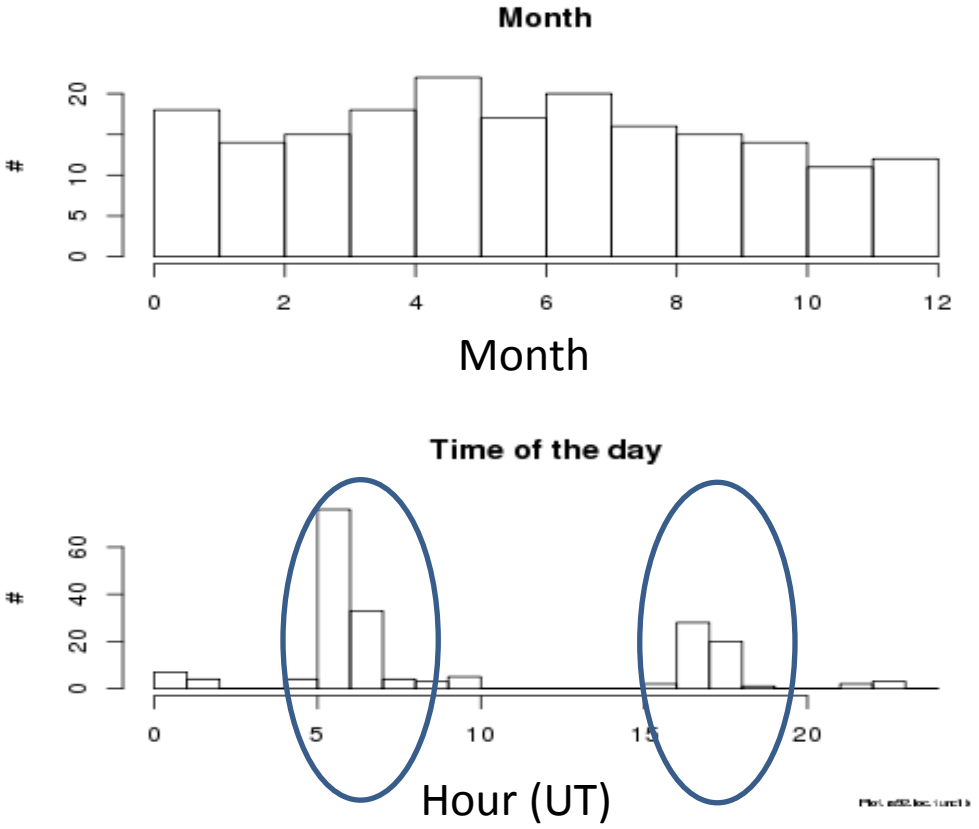
Year	RS92 SGP	RS41 SG	CFH	O3sonde
2014	62	-	3	14
2015	53	-	10	14
2016	54	2	7	21
2017	23	16	4	5

New Member:

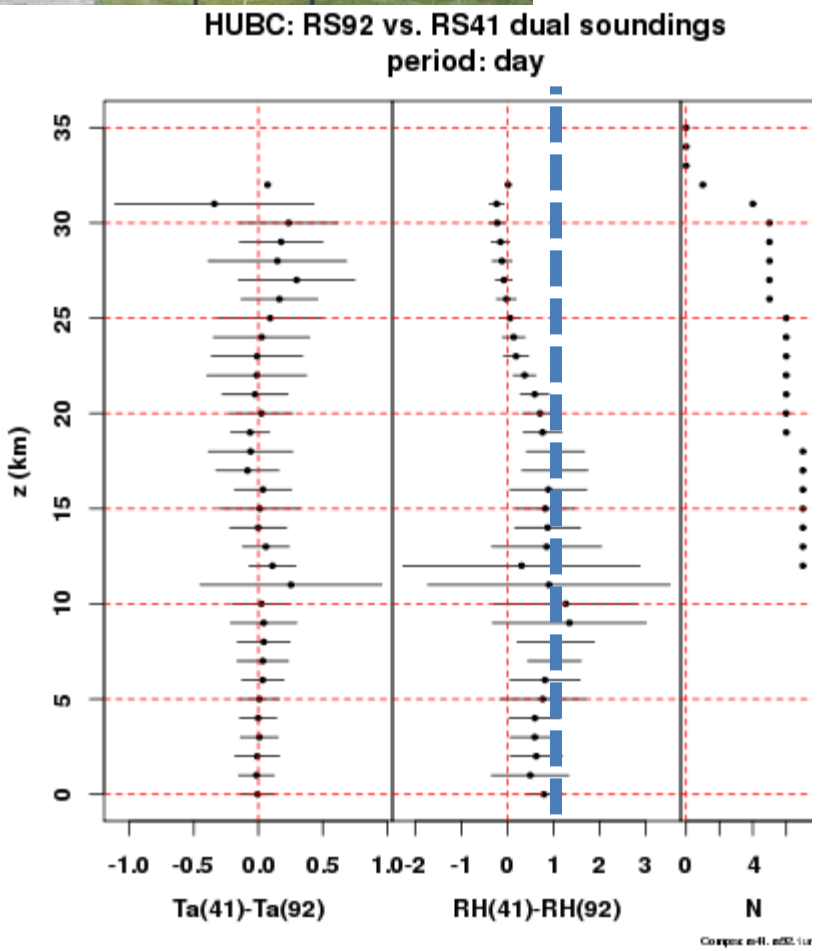
Adrian Flores➔ Belt.

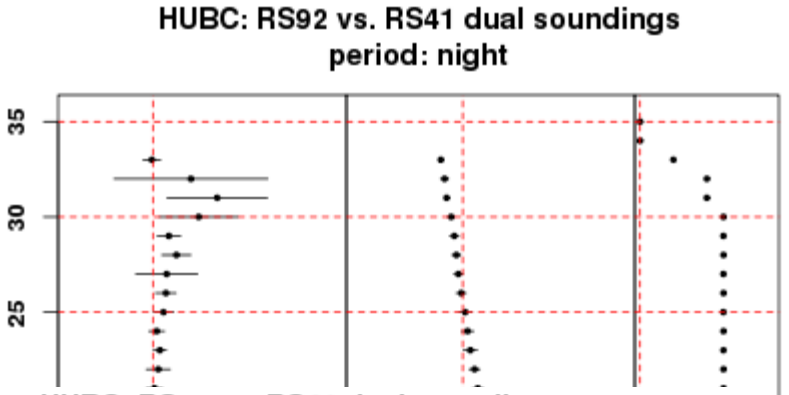
Megan Payne ➔ NWS

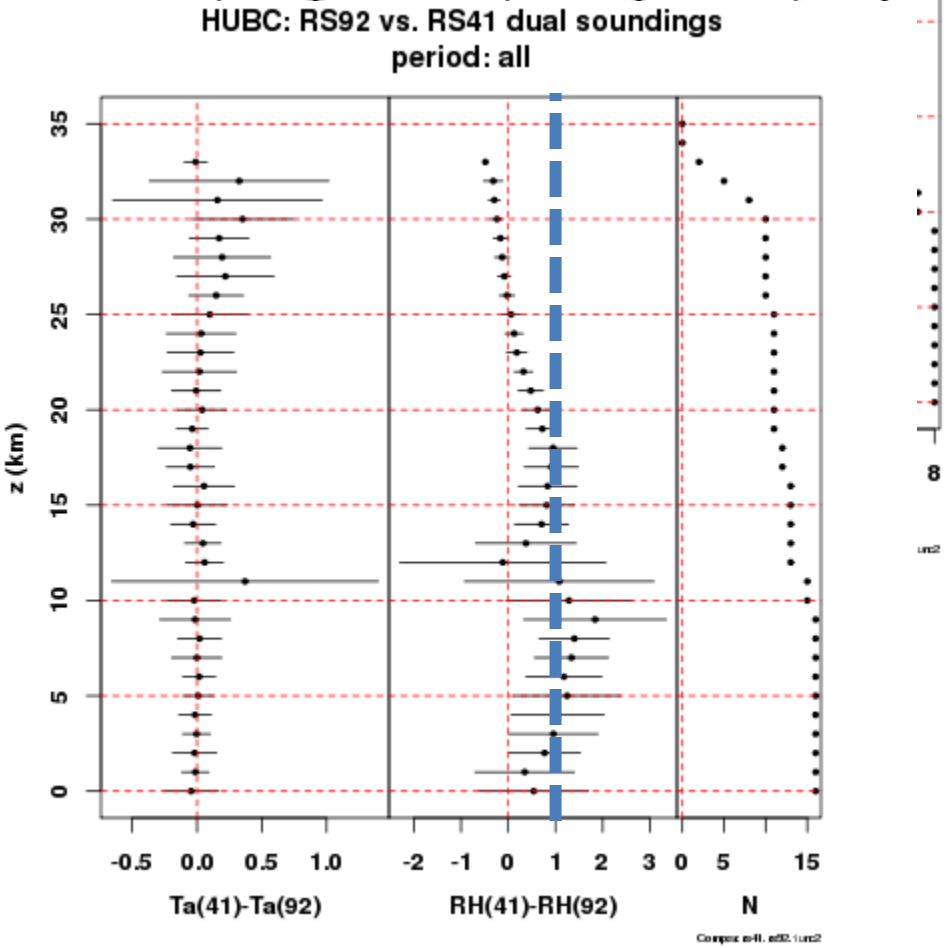




Beltsville: RS92 SGP vs. RS41 SG comparison







Monthly CFH data at Beltsville (K. Vermeesch)

Status:

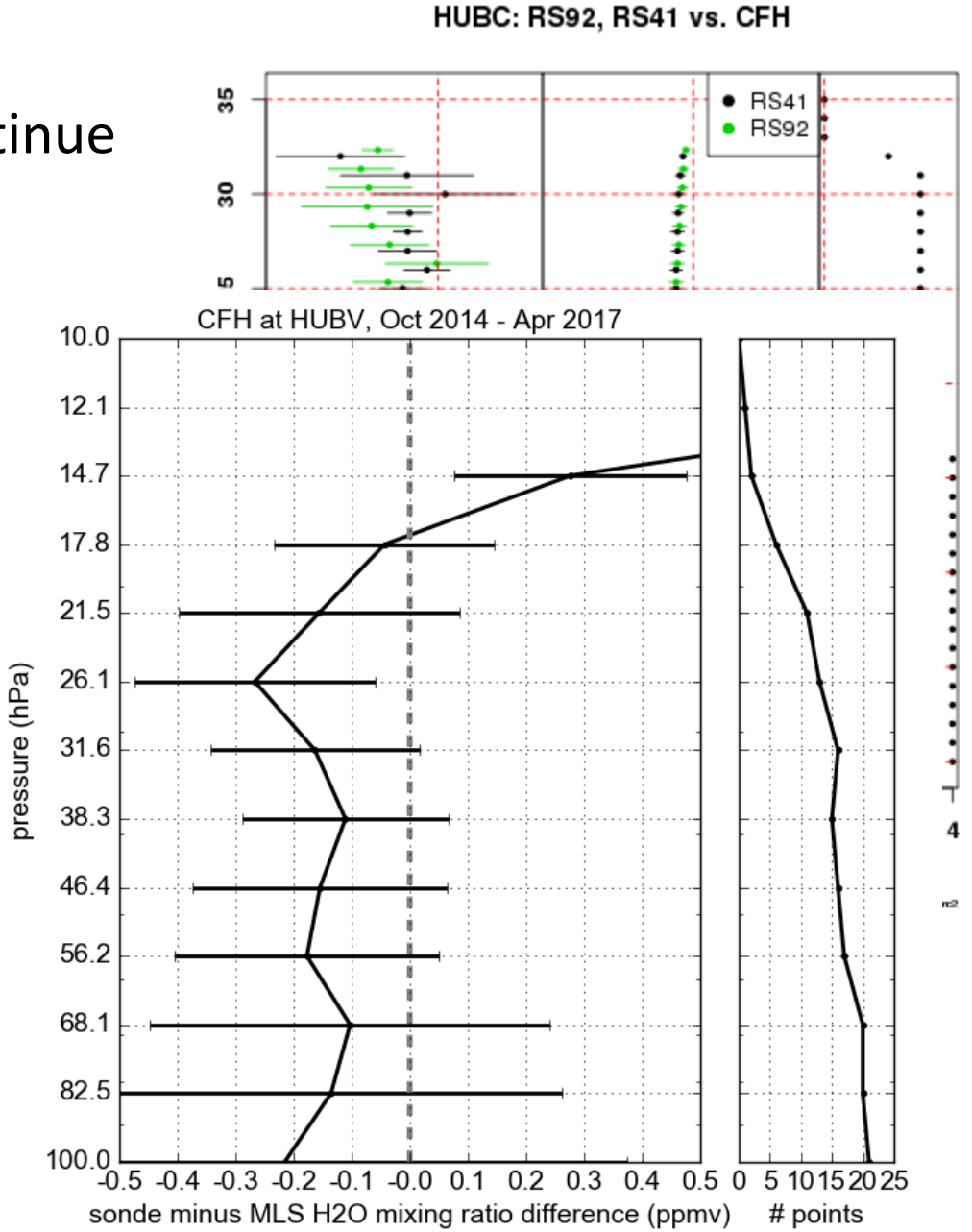
- Monthly CFH launches continue
- Statistics (Vs MLS) ongoing

Other:

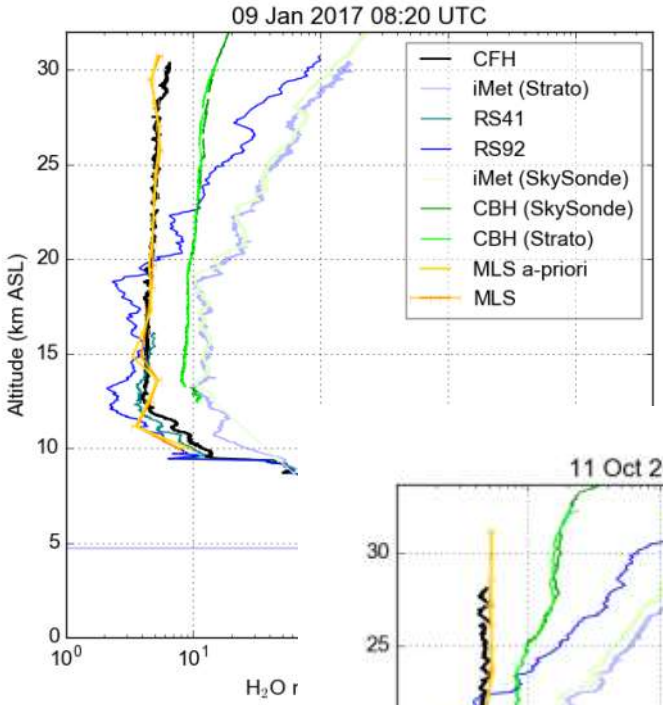
- CBH from Air Labs LLC
- Cost: reduced ($1600)
- Performance: needs work
- Ease: Same like CFH/FPH

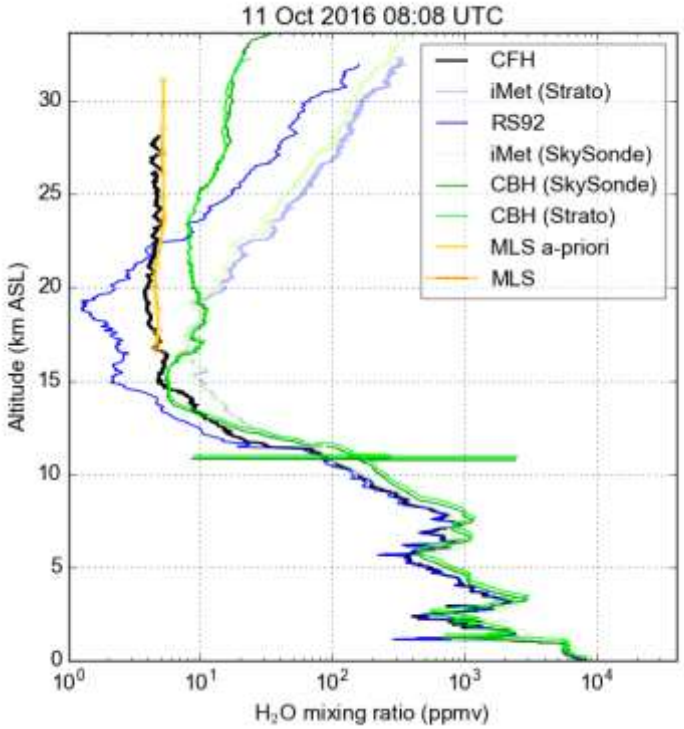
Issues with Cryogen:

- Cost of course
- Operational ease



CBH & CFH at Beltsville (K. Vermeesch)

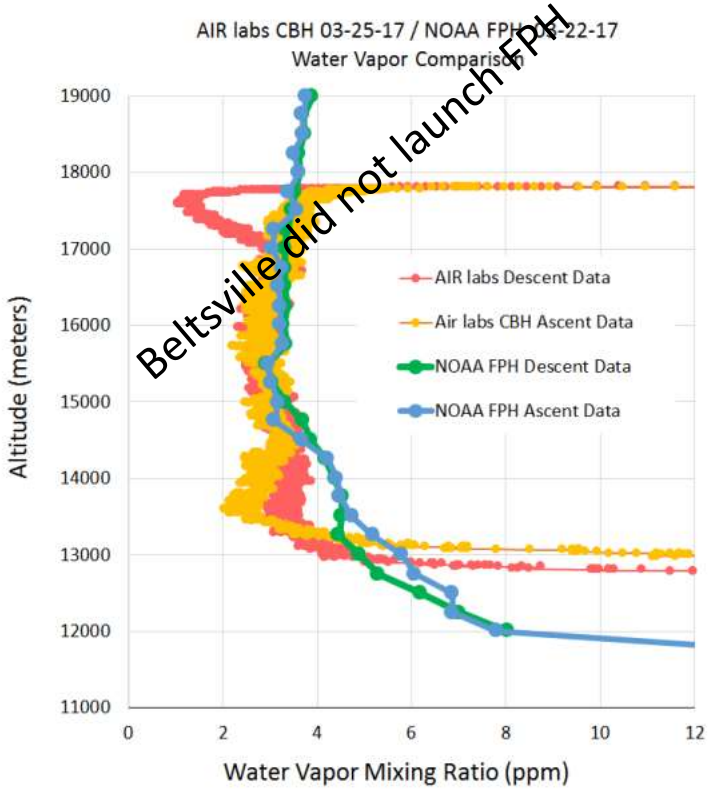




See presentation by Greg Bodeker

Airlabsscientific.com

$1600



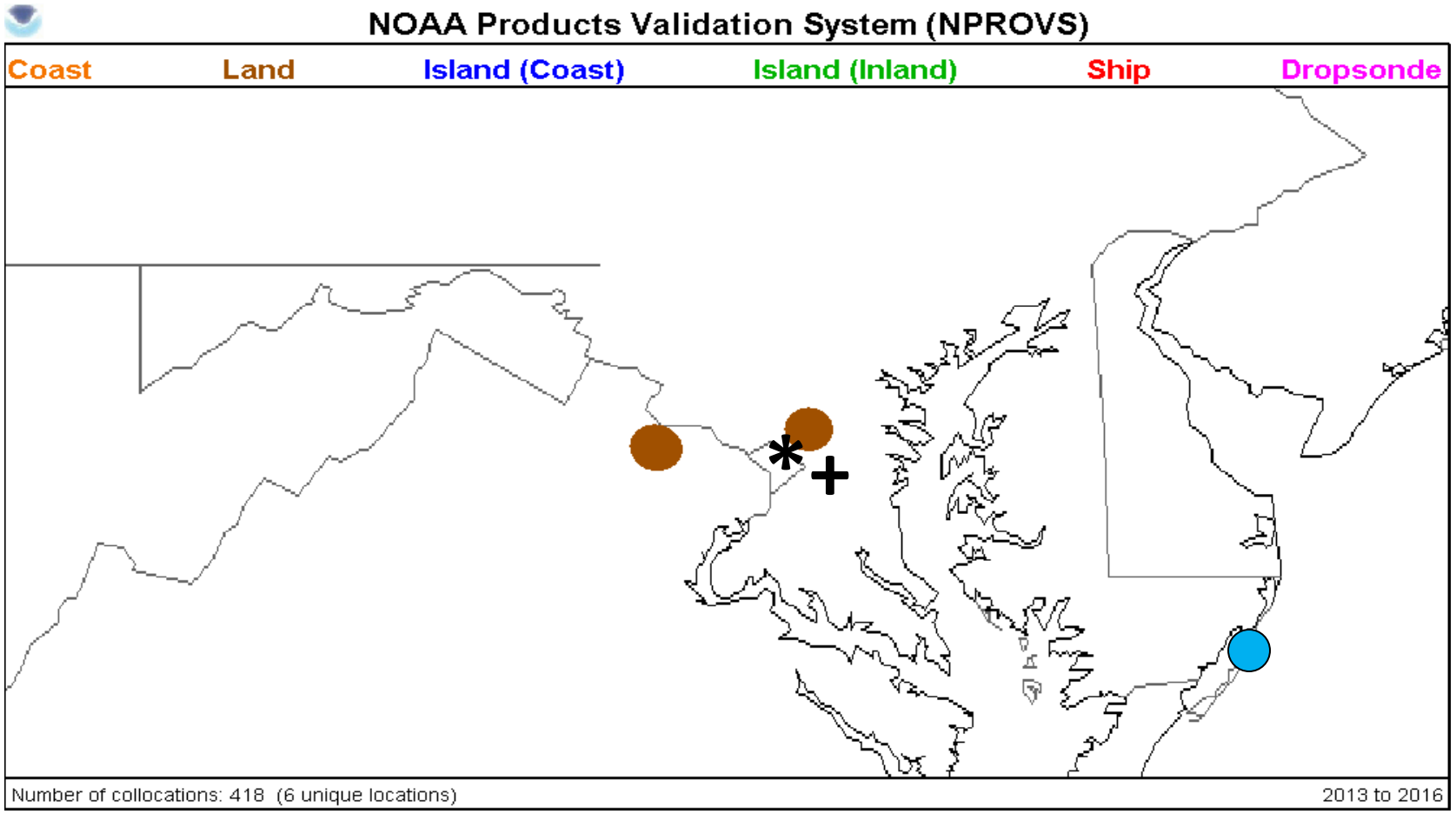
GRUAN Mid-Atlantic Consortium (GMAC)

Vision, Composition, Current Activities, Plans

- ***GMAC is a loose association of scientists that are interested in GRUAN, Sat.-validation, upper-air instrumentation***
  - *Current members include NOAA-NWS; NOAA-STAR; Howard University, UMBC, NOAA-ARL, NASA-GSFC*
- ***Serve as a USA-arm for GRUAN: science, advocacy***
  - *Serve in training of students, technical staff, other*
- ***Semi-Quarterly meetings for update and coordination***
- ***Provide Science input to GRUAN and GRUAN-like activities by its members: NWS-SFSC; HU-Beltsville, STAR***

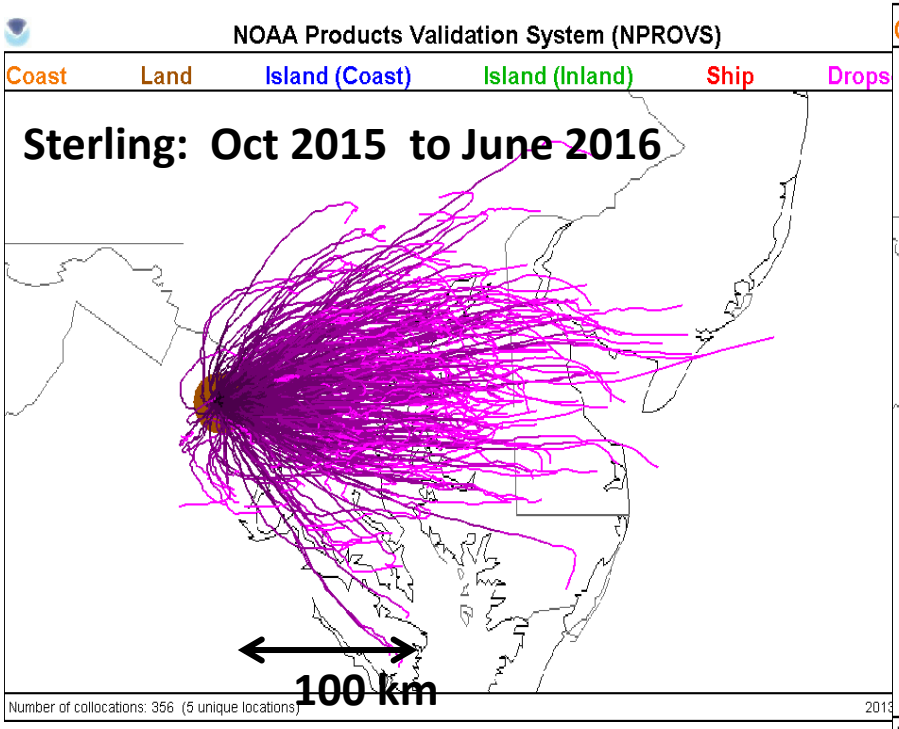
GRUAN Mid-Atlantic Consortium (GMAC)

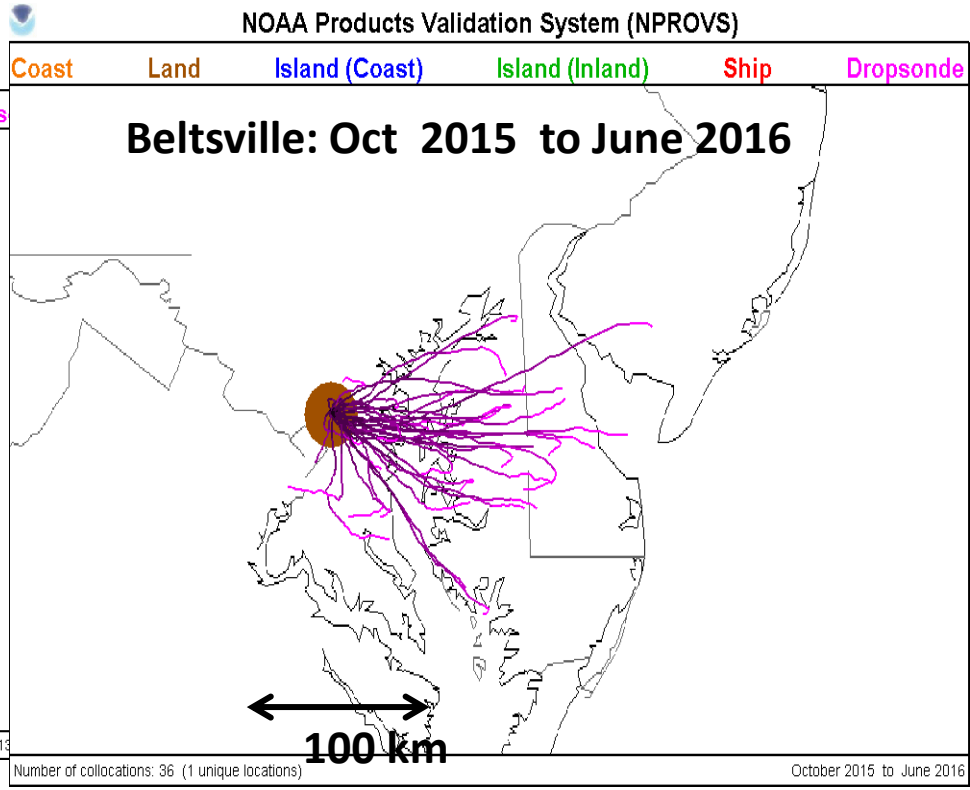
(G-MAC) Contributions



Sterling, Beltsville, NOAA (∗), NASA (+), Wallops (G-MAC)

(G-MAC) Contributions





Radiosonde Launch Synchronization with S-NPP Satellite overpass at Sterling and Beltsville …

5 Sterling / Beltsville synchronized to S-NPP:

10/10/15	114	7100	1733 Z
1/29/16	114	7100	1800 Z
3/18/16	114	7200	1730 Z
4/15/16	114	7100	1705 Z
4/18/16	114	7100	0700 Z

SFSC-Beltsvlle coordinated launches:

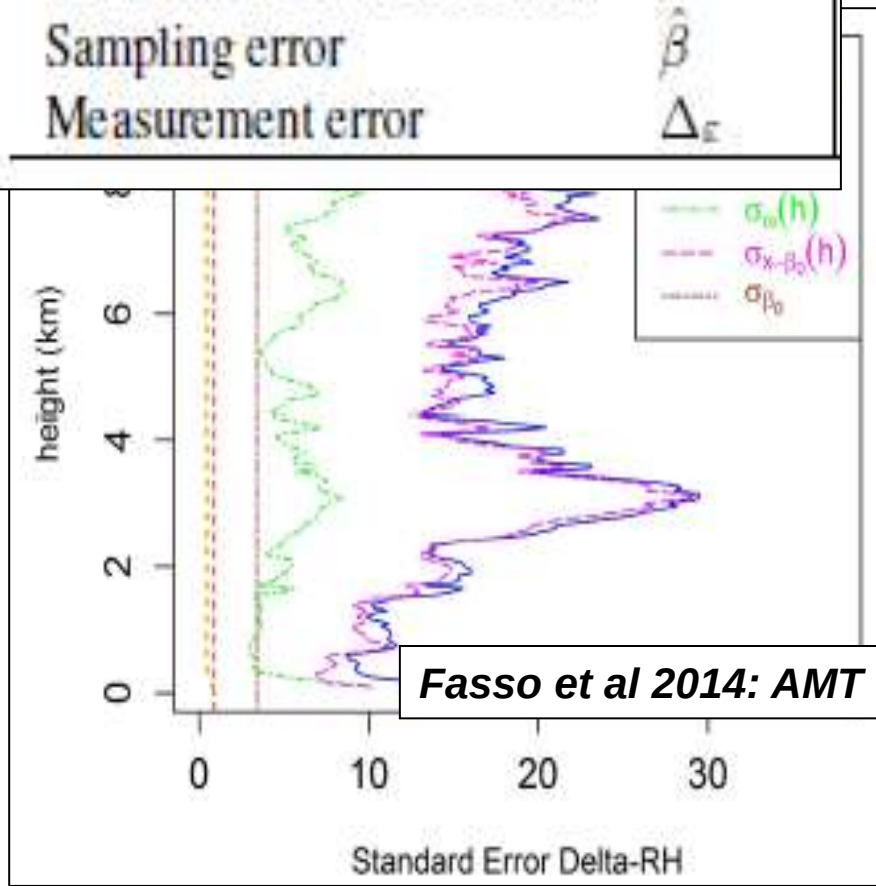
Fasso et al 2014:

- **"simultaneous" sondes at SFSC/HU**
- **RS92 and LMS6 sonde used**
- **Environ. Error (reducible) was the largest error contributor**

Goal: repeat Fasso et al

- **with same sonde type**
- **Simultaneous release.**
- **Compare error profile estimates.**

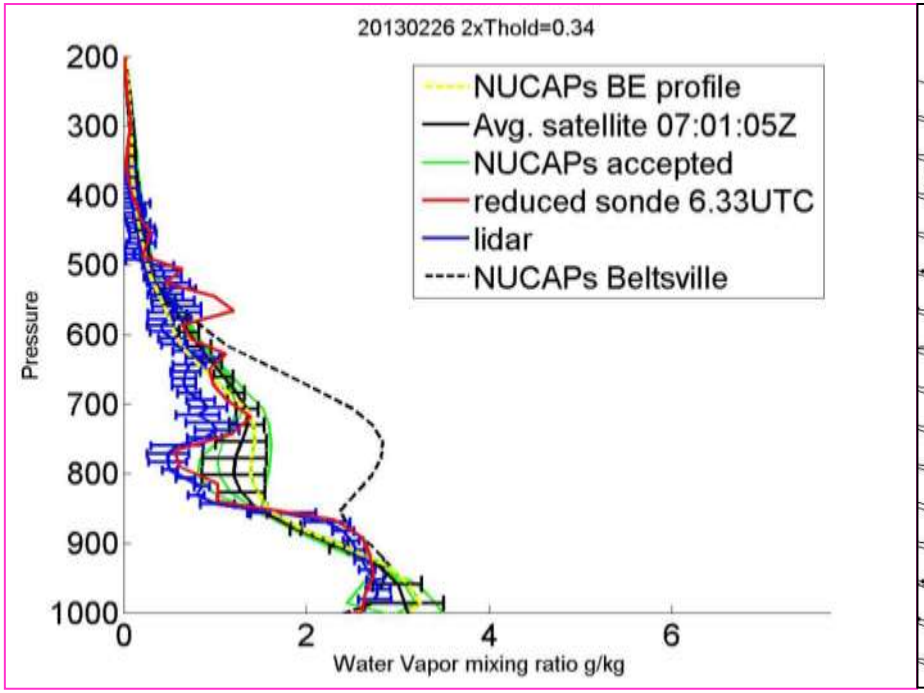
Source of uncertainty	
Total uncertainty	Δ_y
Collocation drift	Δ_μ
Bias (adjustable)	β_0^2
Environ. Error (reducible)	$x - \beta_0^2$
Environ. Error (irreducible)	ω^2
Sampling error	$\hat{\beta}$
Measurement error	Δ_ε

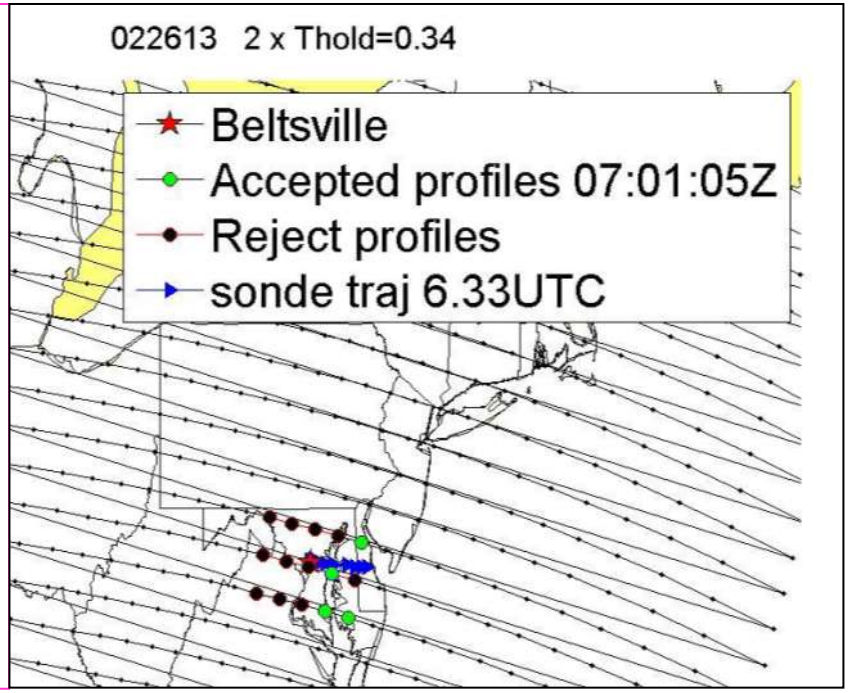


Work towards "SASBE: Monique Walker et al.

Research Objectives

- Validate NUCAPS water vapor retrieval inter-comparing to RAOB
- Weighted Bias vs new method



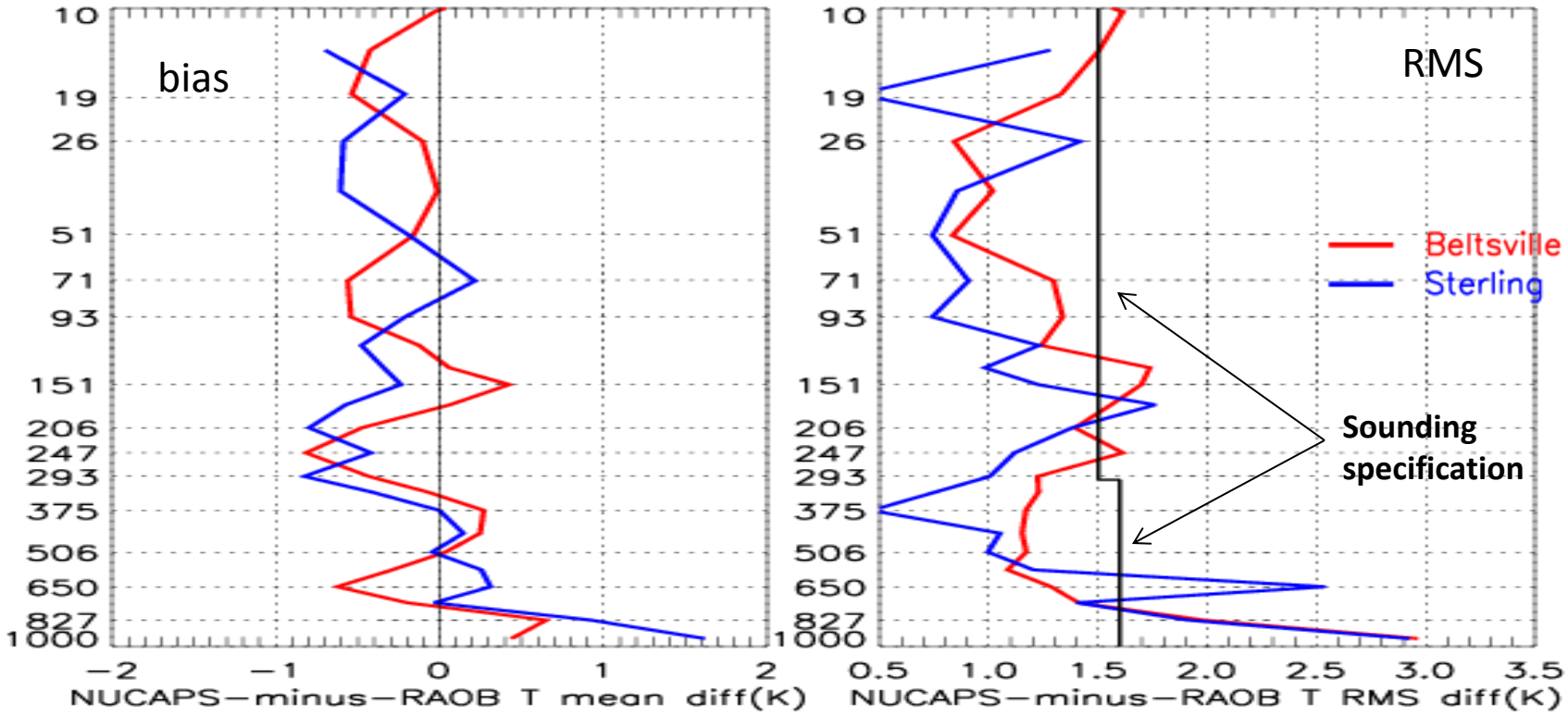


Status work: Monique has a new employer – NGIA.

1st draft document prepared but waiting for updates.

Beltsville & Sterling Synchronized (S-NPP) RAOBs (RS92) Used in S-NPP Sounding Product Cal/Val

NUCAPS IR+MW Temperature Sounding

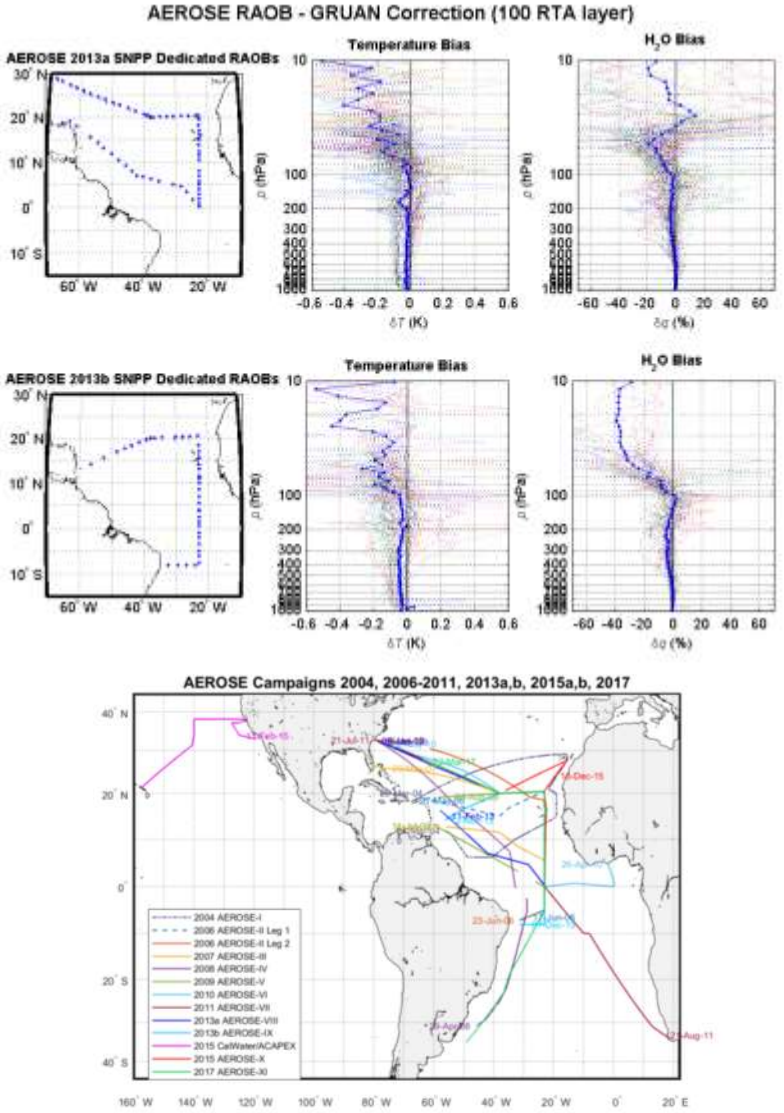


- **8** Sterling synchronized to S-NPP
- **90** Beltsville synchronized to S-NPP

Sun et al. (2017, JSTARS)

GRUAN Reprocessed AEROSE RAOBs

- In 2014, the GRUAN Lead Center (R. Dirksen et al.) reprocessed Vaisala RS92 RAOBs obtained from the 2013a,b NOAA AEROSE campaigns
- The GRUAN-corrected RAOB moisture profiles were shown to have reduced dry bias in the upper troposphere relative to the NUCAPS moisture EDR product
- AEROSE Vaisala RS92 RAOBs go all the way back to 2006, and campaigns have since been conducted in 2015 and 2017
  - GRUAN reprocessing of these AEROSE campaigns (using the latest GRUAN processing software) would be valuable for multiple applications, including NOAA satellite validation



LC Visit
Multi-sonde Experiement
Autolaunchers

NWS Participation

- 2015 & 2016 GRUAN meetings conveyed NWS's re-kindled interest to participate in GRUAN
- NWS supports GRUAN on a limited basis via Sterling's participation in the GMAC
- Beltsville applied and is certified to be an official GRUAN station; GMAC is formed

NWS/Lead Centre Meeting Topics

- Methodology & results of radiation & response time tests
- GRUAN data processing and database
- GRUAN ground checks (Standard Humidity Chambers)
- SFSC capabilities and general radiosonde evaluation methodology
- Tour
- Future plans and possible collaborations

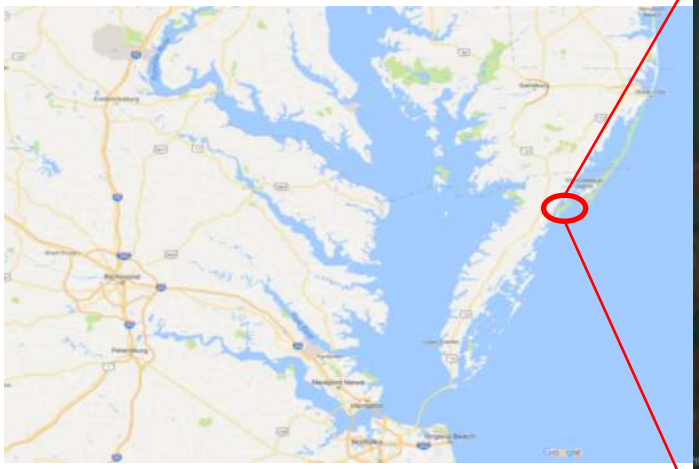
Task	Progress & Priority
Perform weekly dual Vaisala RS92 and Vaisala RS41 soundings	Intent to do a weekly RS41 to RS92 flight Wrapped into Wallops RS41 evaluation
Evaluate GPS receivers and associated algorithms of commercial-off-the-shelf radiosounding systems with new GPS simulator system	In-Progress- developing procedures – high priority
Conduct laboratory humidity response time experiments	Concept and Design Phase – moderate priority
Conduct laboratory radiation effect experiments	Acquisition In-Progress – high priority
Qualify Lockheed Martin Sippican's Multi-thermistor Radiosonde (MTR) as a GRUAN reference temperature radiosonde	LM no longer producing MTR Richard Medina (Post-Doctoral Fellowship)
Qualify Lockheed Martin Sippican's LMS-6 radiosonde as a GRUAN radiosonde.	No progress – student task?
Lead new task for GRUAN on evaluating surface based instrumentation	Could be introduced at ICCM ??
Serve as secondary repository for GRUAN data with SFSC's upgraded science server capability	Acquisition delayed
Assist with developing GRUAN omnibus document for radiosonde errors	No progress

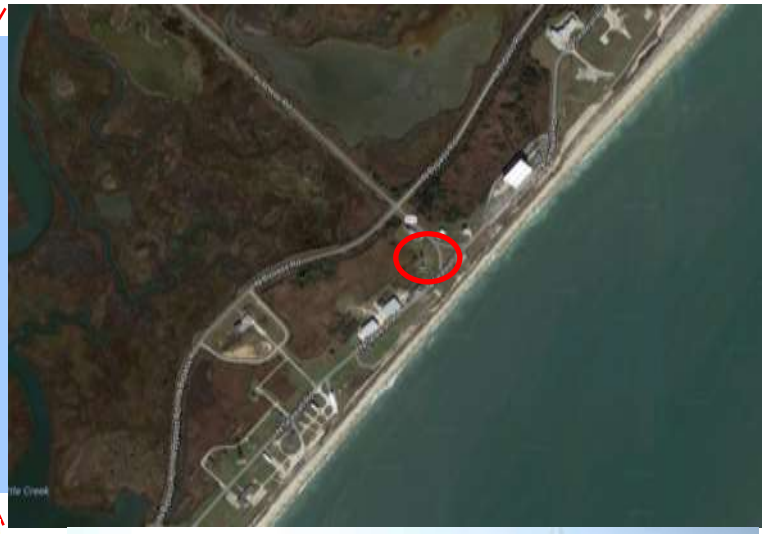
Wallops Deployment 6-16 Feb 2017

Purpose – assess Vaisala RS41 (Autosonde) into NWS network:

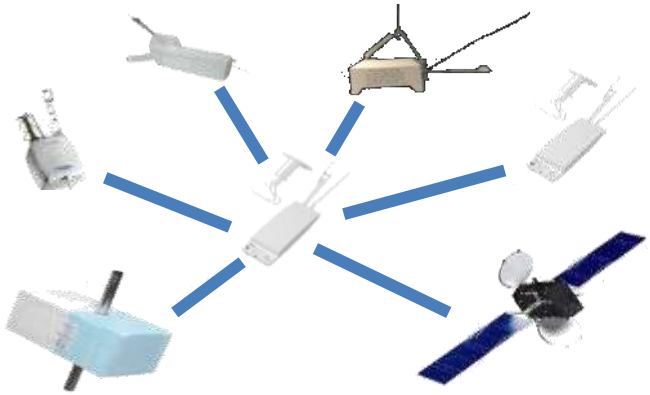
- Provide guidance to NWS Program Management Office for RS41 radiosonde
- Demonstrate added value using ancillary measurements (NESDIS data in particular), especially for a non-competitive characterization. And for future operational UA measurements.
- Quality over quantity – larger balloon payloads including Cryogenic Frostpoint Hygrometers (CFH) and coincident satellite overpasses
- First look at Data Continuity Study collaboration

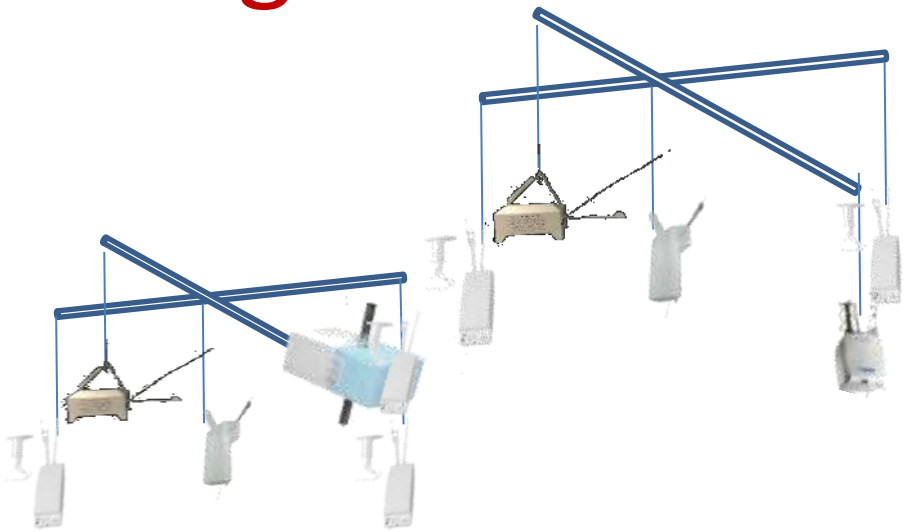
Wallops Island, Virginia





Comparisons & Configurations





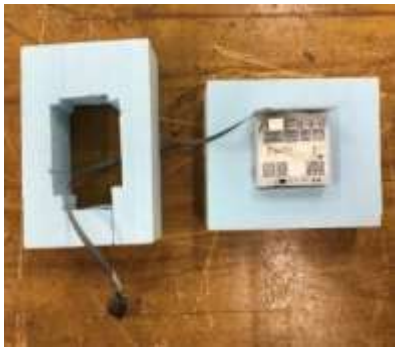
February 2017

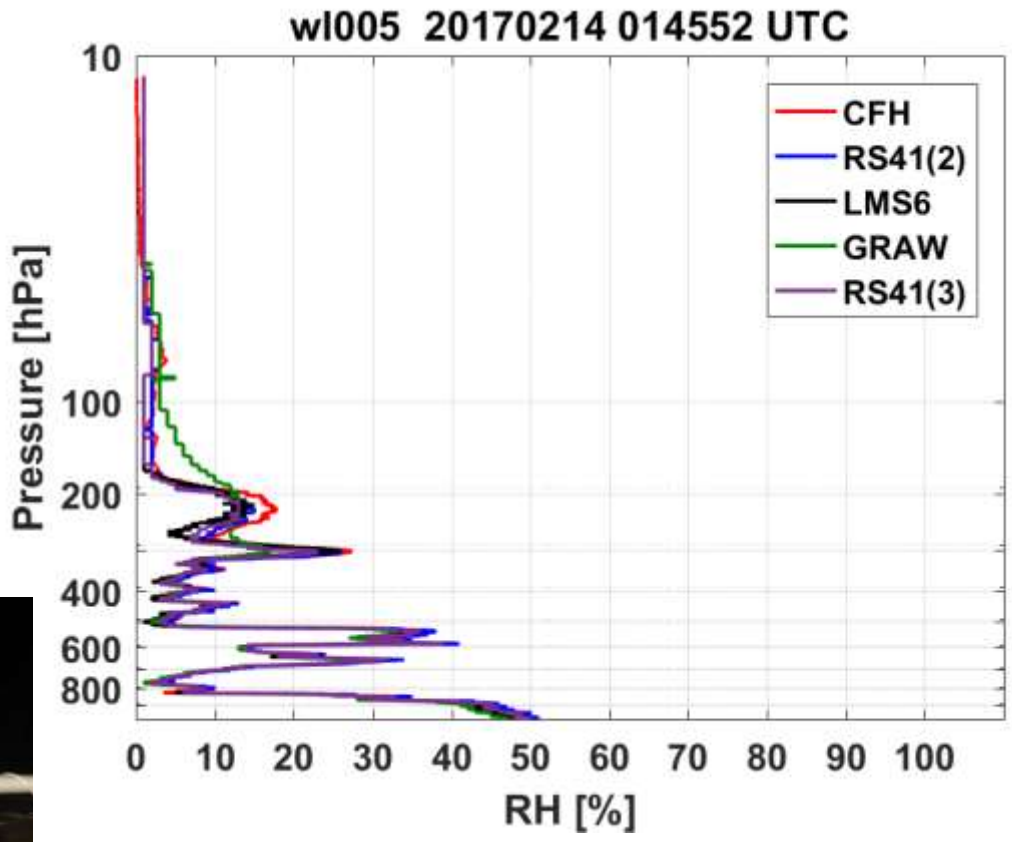
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 Deployment	2 R-23 Delivery Helium and Dry Ice Delivery (AirGas)	3	4
5	6 8:30 pm 12:37 pm (OP) 20:30 pm 23:59 pm	7 9:24 am (OP) 12:18 pm (OP) 20:45 pm (OP) 23:45 pm	8 8:30 am 12:00 pm 20:24 pm (OP) 23:45 pm	9 9:29 am (OP) 13:00 pm (3 staff) 20:30 pm 23:59 pm Helium and Dry Ice Delivery (AirGas)	10 8:30 am 12:00 pm 20:29 (OP)	11 1:22 am (OP) 9:42 am (OP) 12:43 pm (OP) 20:30 pm 23:59 pm
12 9:21 am (OP) 12:24 pm (OP) 20:41 pm (OP) 23:45 pm	13 8:30 am 12:00 pm 20:30 pm 23:59 pm	14 9:26 am (OP) 12:30 pm 20:46 pm (OP) 23:59 pm	15 8:30 am 12:00 pm 20:25 pm (OP)	16 1:28 am (OP) 8:30 am 12:00 pm 20:30 pm	17 9:17 am (OP) 12:30 pm Breakdown and Pack up Leave for Sterling	18
19	20	21	22	23	24	25

Crossbeam Bar Assembly

CFH


SFSC Custom Made
Interface Card Install

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Pressure [hPa]
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RH [%]
CFH
RS41(2)
LMS6
GRAW
RS41(3)

Vaisala Autosonde Characterization

- Vaisala AS14 Autosonde was installed at the Sterling Field Support Center January 2015
- Characterization of the AS14 occurred from March 2015 – August 2015
- Continued weekday synoptic flights from September 2015 – July 2016
- US certified for hydrogen use in March 2016
- Converted to the AS15 for use with the RS41 family of radiosondes in July 2016
- Characterization and software familiarization period of August 2016 – November 2016
- Halt in flights from December 2016 – March 2016 due to radiosonde supply
- Continuation of characterization of the AS15 occurring from March 2016 – June 2016

Meteomodem Robotsonde Characterization

- Meteomodem Robotsonde installed at the Sterling Field Support Center in March 2017
- Characterization of the Robotsonde occurring from March 2017 – March 2018

GRUAN Mid-Atlantic Consortium (GMAC)

Going forward

A question for GRUAN community:

How else can GMAC can help GRUAN?

Thank you