GRUAN Task Team on Ancillary Measurements (TTAM)
ICM-4 Report

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GRUAN-TTAM (TT5) Historical (1)

July 2010: First Contacts

October 2010: Terms of Reference

1. Interface with other Expert Teams (e.g., NDACC)
2. Evaluate the data products (uncertainty budget) and bring in missing knowledge
3. Inventory potential instruments
4. Establish campaign rationales for validation of data from multiple platforms
5. Establish a system for the routine collection and display of data from multiple platforms
6. Develop guidance on the type and amount of data and metadata needed
7. Draw conclusions on the suitability of deployed equipment

2011: "Bring-in Knowledge" Activities

Lidar: ISSI Team on Lidar Algorithms (O3,T)
Microwave: MWRnet meetings
FTIR: MUSICA project
Satellite: JPSS, NPROVS, SASBE, GEWEX

Until January 2012: No "live" meeting between members, only emails
January 2012: First "live" meeting (telecon)

GRUAN-TTAM (TT5) Historical (2)

2012: Instrument Guidelines First Drafts

Lidar: *Guidelines First Draft submitted January 2012*
Microwave: *First Draft to be submitted August 2012*
FTIR: *First Draft to be submitted August 2012*

Team Members (as of February 2012)

A. Apituley	*KNMI*	*Lidar*
N. Cimini	*CNR*	*Microwave*
A. Haefele	*MeteoSwiss-Payerne*	*Microwave and Lidar*
J. Hannigan	*NCAR*	*FTIR*
N. Kämpfer	*Univ. Bern*	*Microwave*
T. Leblanc (co-chair)	*NASA-JPL*	*Lidar*
T. Reale (co-chair)	*NOAA-NESDIS*	*Satellite/assimilations*
M. Schneider	*(KIT/IMK and ASF)*	*FTIR*
M. Schröder	*DWD*	*Satellite/assimilations*
M. Sommer	*DWD*	*GRUAN LC*
D. Tobin	*Univ. Wisc.*	*Satellite/assimilations*
D. Whiteman	*NASA-GSFC*	*Lidar*

Task-by-Task Progress Update (1)

ISSI Expert Team on Lidar Algorithms (O3/T)

TT5 PoC: *Thierry Leblanc*

Completed: *Development and validation of vertical resolution standardization tools. Tools consist of IDL, MATLAB and FORTRAN routines that can be plugged-in the NDACC PIs' lidar data processing softwares for an easy, ready-to-use conversion of the vertical resolution into the NDACC-standardized definition*

Next: *Write-up Report on Vertical Resolution and development of similar tools for uncertainty budget.*
Meeting #3 in September 2012, incl. Final Report design and preparation

MWRnet

TT5 PoC: *Nico Cimini*

Completed: *2 meetings in 2010/11 led to 13 actions and 19 recommendations on measurement mode, common calibration and its control procedures, quality control, retrieval algorithm, metadata & data formats and archiving, reprocessing, practical issuesand tips, harmonized retrieval products, requirements for on-line processing*

Next: *Material discussed and reported within MWRnet to be transferred into the upcoming GRUAN Microwave Radiometer Guidelines*

Task-by-Task Progress Update (2)

JPSS

TT5 PoC: Tony Reale

Completed: Provided briefs to JPSS cal/val team on routine validation of NPP Environmental Data Record (EDR) for atmospheric temperature and moisture soundings and opportunities for special validation exercises at GRUAN sites

Next: Focus of intensive validation at ARM sites (resource permitting) for special sonde launches at NPP overpass

NPROVS

TT5 PoC: Tony Reale

Completed: Initial NOAA Products Validation System (NPROVS) interface to integrate, display and analyze GRUAN (radiosonde) observations accessed from NCDC using NPROVS

Next: Integrate GRUAN sondes with historical NPROVS satellite collocation data (2011, Lindenberg, Tateno) and incorporate "uncertainty" in analysis

Task-by-Task Progress Update (3)

MUSICA

TT5 PoC: *Matthias Schneider*

Completed: *Consistency of MUSICA's ground- and space-based H2O and HDO/H2O (GB FTIR and IASI) remote sensing products for a subtropical ocean scene (Schneider and Hase, ACP, 2011)*

Next: *Examine long-term consistency (the whole IASI period: 2007-2012) and develop IASI land scene retrievals*

GEWEX Water Vapor and Temperature Assessment

TT5 PoC: *Marc Schröder*

Completed: *Kick-off Meeting in March 2011 during which a 3-yr raodmap was defined*

Next: *Second Assessment Workshop in 2012 (May or Sept.), 2nd circular released. Assessment plan extended from the GEWEX News from May 2011. To be released in March 2012*

Task-by-Task Progress Update (4)

Best Measurement Practices: GRUAN Lidar Guidelines Doc

TT5 PoC: *T. Leblanc*

Completed: *First draft submitted to TT5 and GRUAN TT co-chairs in January 2012*
Robust Data Quality Control and Traceability structure based on:
IGLIMP + LidarRunClient + GLASS

Next: *Revisions. Submission to GRUAN-wide community for review*
Synchronization with revised GRUAN Manual
See presentation later this week in Session 7

In short:

Conceptually, *the Lidar Guidelines are a direct adaptation of the GRUAN Philosophy and Guidance described in the GRUAN Manual to the specific case of lidar*

Practically, *the Guidelines describe a fully integrated system which optimizes key concepts within GRUAN: quality, consistency, and traceability*

Technically, *this integrated system relies on three key tools:*
- *IGLIMP (Individual GRUAN Lidar Measurement Protocol): a core meta data document*
- *LidarRunClient: the interface utility based on the same principle as RSLaunchCLient*
- *GLASS (GRUAN Lidar Analysis Software Suite): a centralized data processing software*

See full presentation later this week in Session 7

New Publications Relevant to GRUAN/TTAM (1)

On FTIR+IASI (PoC: M. Schneider)

Schneider, M. and Hase, F.: Optimal estimation of tropospheric H2O and δD with IASI/METOP, Atmos. Chem. Phys., 11, 11207-11220, doi:10.5194/acp-11-11207-2011, 2011

AMT Special Issue on MOHAVE-2009 (PoC: T. Leblanc)

Leblanc, T., et al.: Measurements of Humidity in the Atmosphere and Validation Experiments (MOHAVE)-2009: overview of campaign operations and results, Atmos. Meas. Tech., 4, 2579-2605, doi:10.5194/amt-4-2579-2011, 2011

Hurst, D. F., et al.: Comparisons of temperature, pressure and humidity measurements by balloon-borne radiosondes and frost point hygrometers during MOHAVE-2009, Atmos. Meas. Tech., 4, 2777-2793, doi:10.5194/amt-4-2777-2011, 2011

Leblanc, T., McDermid, I. S., and Walsh, T. D.: Ground-based water vapor Raman lidar measurements up to the upper troposphere and lower stratosphere for long-term monitoring, Atmos. Meas. Tech., 5, 17-36, doi:10.5194/amt-5-17-2012, 2012

Stiller, G. P., et al.: Validation of MIPAS IMK/IAA temperature, water vapor, and ozone profiles with MOHAVE-2009 campaign measurements, Atmos. Meas. Tech., 5, 289-320, doi:10.5194/amt-5-289-2012, 2012

New Publications Relevant to GRUAN/TTAM (2)

On Microwave+ARIS Campaign (PoC: A. Haefele)

Straub, C., et al.: ARIS-Campaign: intercomparison of three ground based 22 GHz radiometers for middle atmospheric water vapor at the Zugspitze in winter 2009, Atmos. Meas. Tech., 4, 1979-1994, doi:10.5194/amt-4-1979-2011, 2011

On NPROVS (PoC: T. Reale)

Reale, A., Sun, B., Pettey, F., and Pettey, M.: The NOAA Products validation System (NPROVS), JTECH-A, D-11-00072, accepted 11-2011

Task-by-Task Progress Update: New Tasks (1)

Best Measurement Practices: GRUAN Microwave Guidelines Doc

TT5 PoC: *N. Cimini and N. Kämpfer*

Next: *First draft to be submitted to TT5 in August 2012*
Significant leverage from MWRnet

Best Measurement Practices: GRUAN FTIR Guidelines Doc

TT5 PoC: *M. Schneider and J. Hannigan*

Next: *First draft to be submitted to TT5 in August 2012*
Significant leverage from MUSICA

Inventory of Instruments: AERI

TT5 PoC: *J. Hannigan*

Next: *J. Hannigan and M. Schneider, to investigate on the possibility to bring AERI instrument into GRUAN*

Task-by-Task Progress Update: New Tasks (2)

Interface with other Expert Teams: EARLINET

TT5 PoC: *A. Apituley*

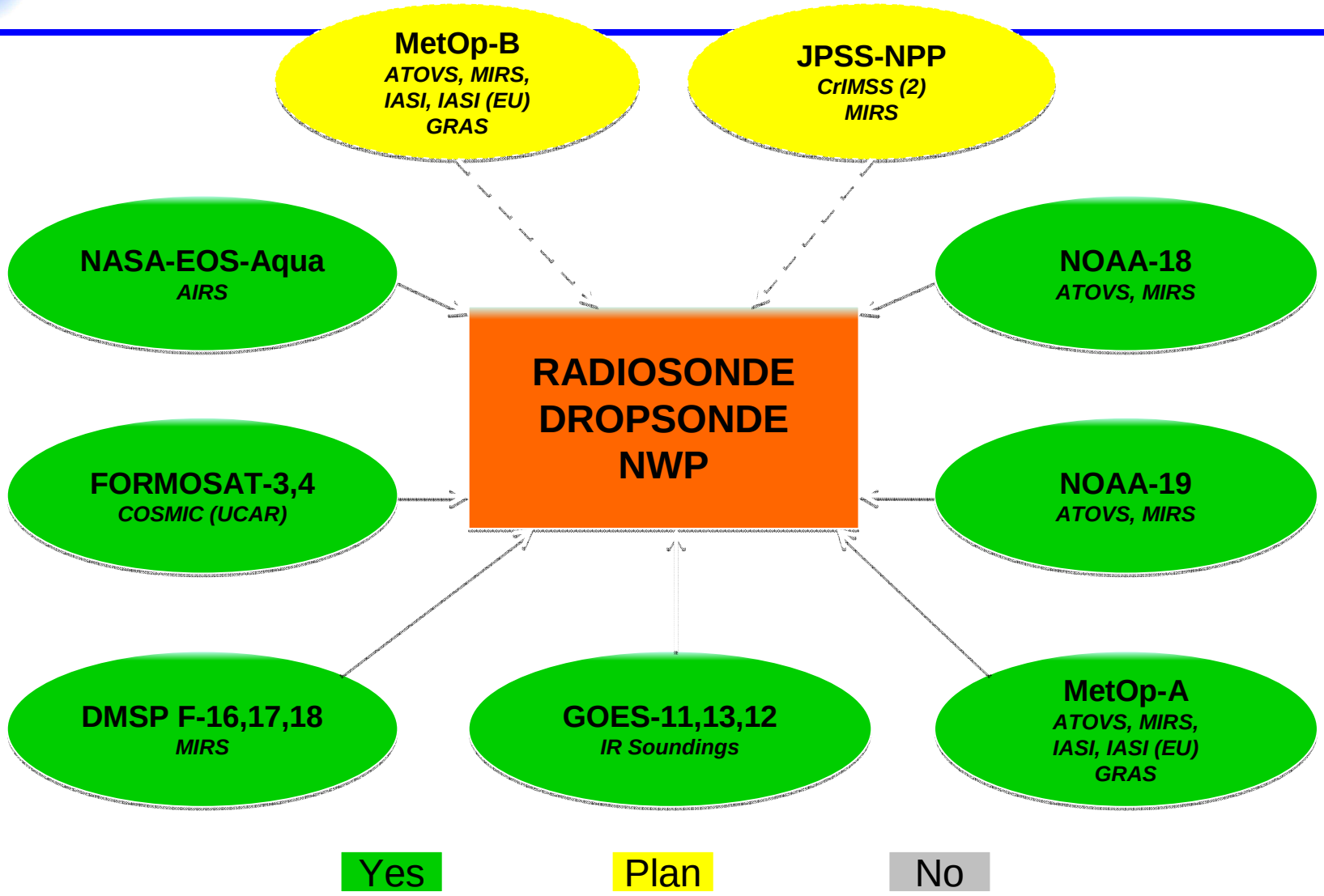
Next: *A. Apituley and T. Leblanc to inquire to EARLINET colleagues on the status of their Centralized Data processing Algorithm and study possible synergy between EARLINET and GRUAN*

Best Measurement Practices: Site Atmospheric State Best Estimate (SASBE)

TT5 PoC: *Dave Tobin*

Completed: D. Tobin, new to TT5, in contact with J Dykema and T. Reale

Next: *Investigate essential "recipe" of GRUAN ancillary and sonde measurements (including uncertainties) to calculate SASBE with focus on atmospheric temperature and moisture for NPP satellite hyper-spectral products validation*

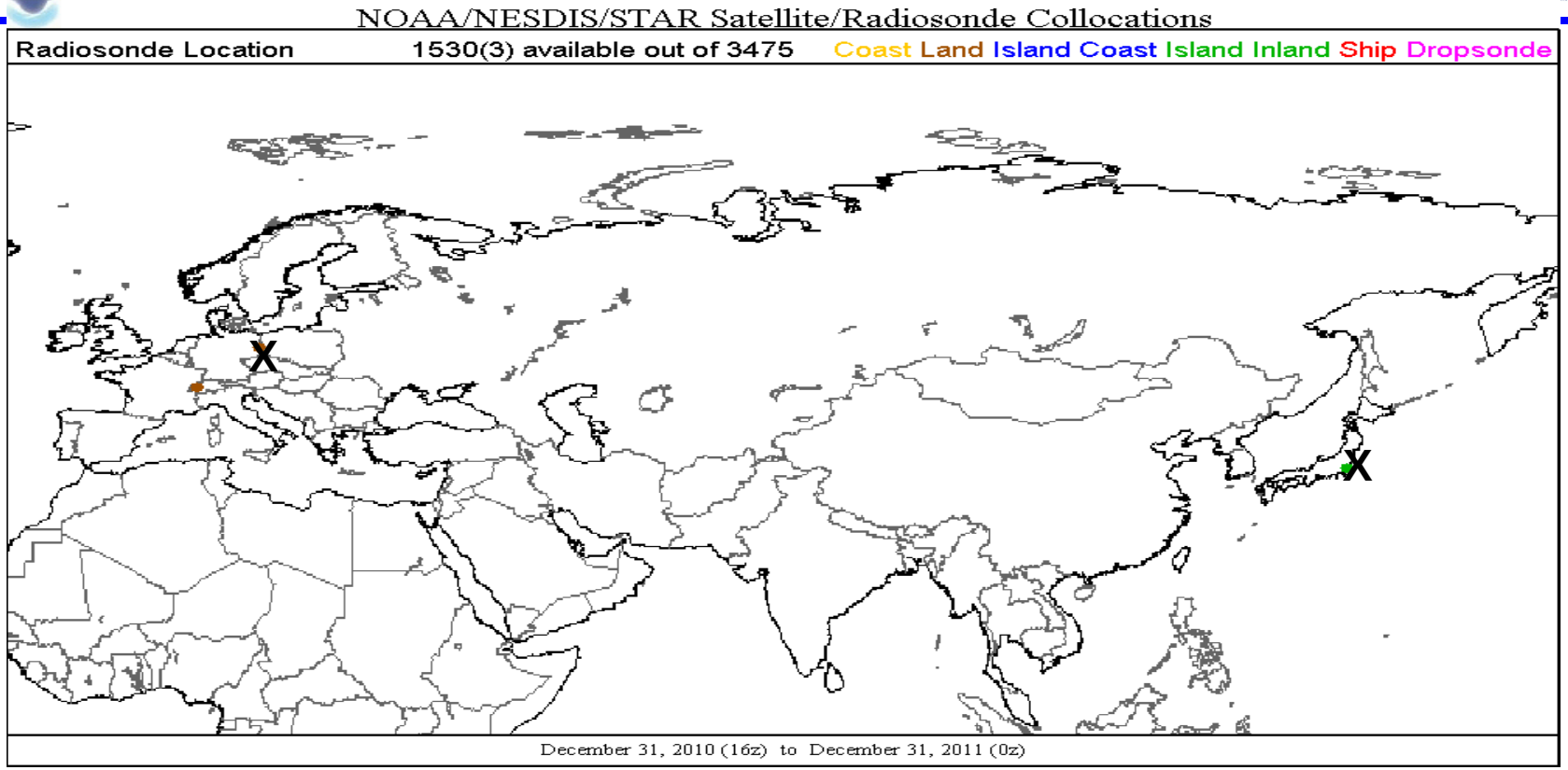


NOAA Products Validation System (NPROVS) Schematic

GRUAN Products Validation System (GPROVS)

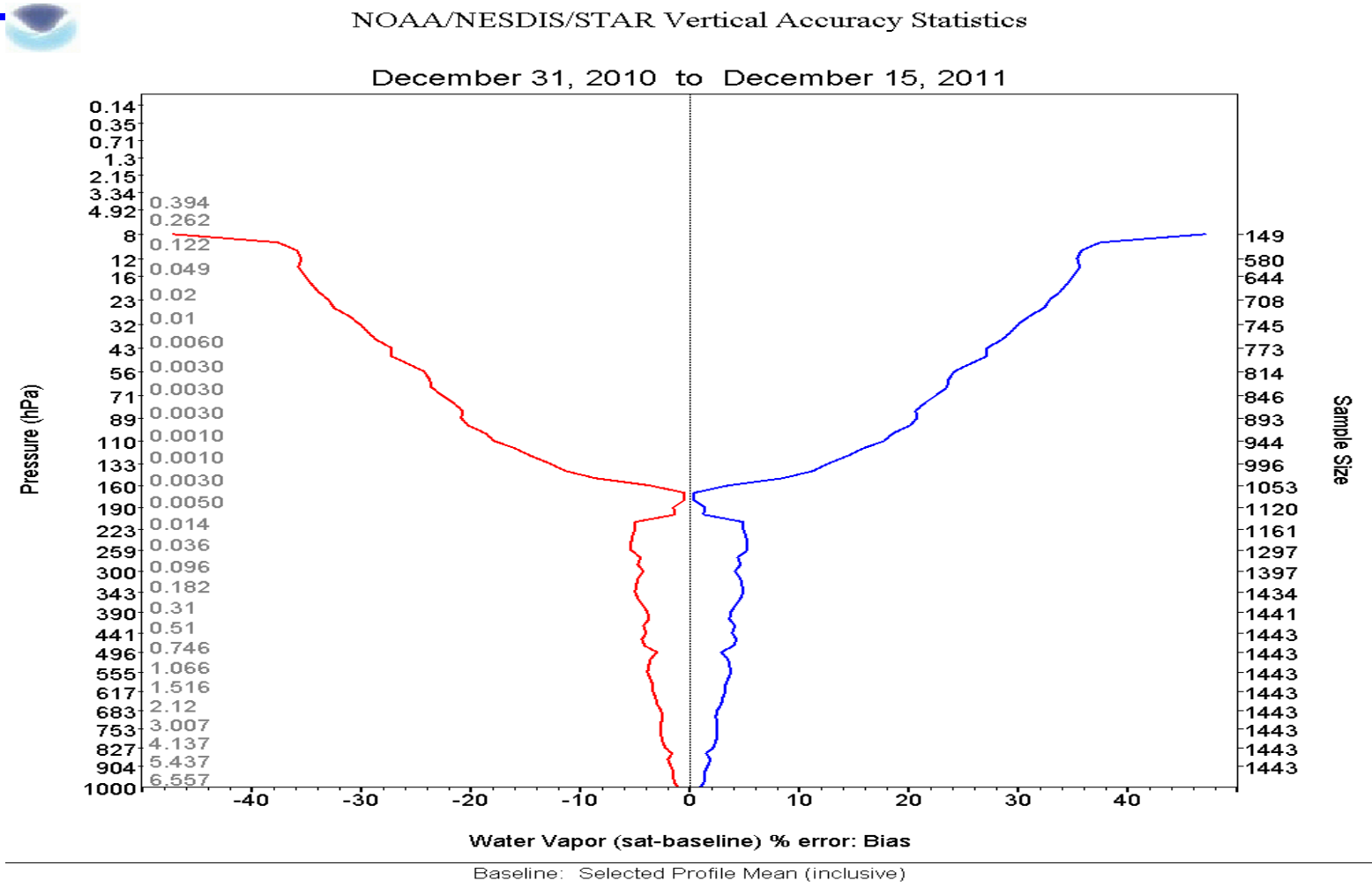
- NPROVS at GRUAN sites … year(s)
- GRUAN site sondes + corrections, uncertainty…
- Ancillary Profiles
- Net CDF 4

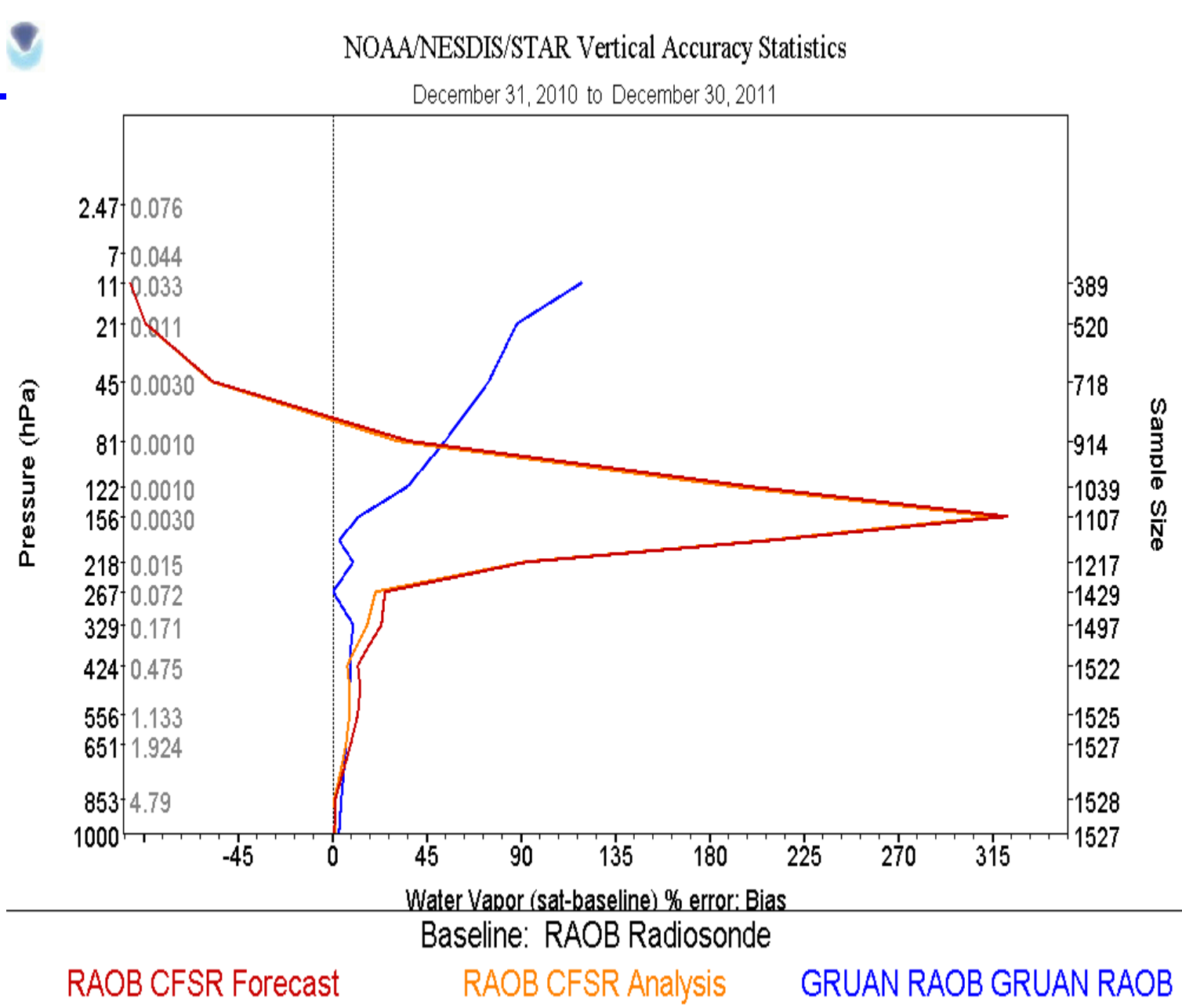
- GATNDOR tool (Immler… Fabbio/Allessandro…
- SASBE
- RT model



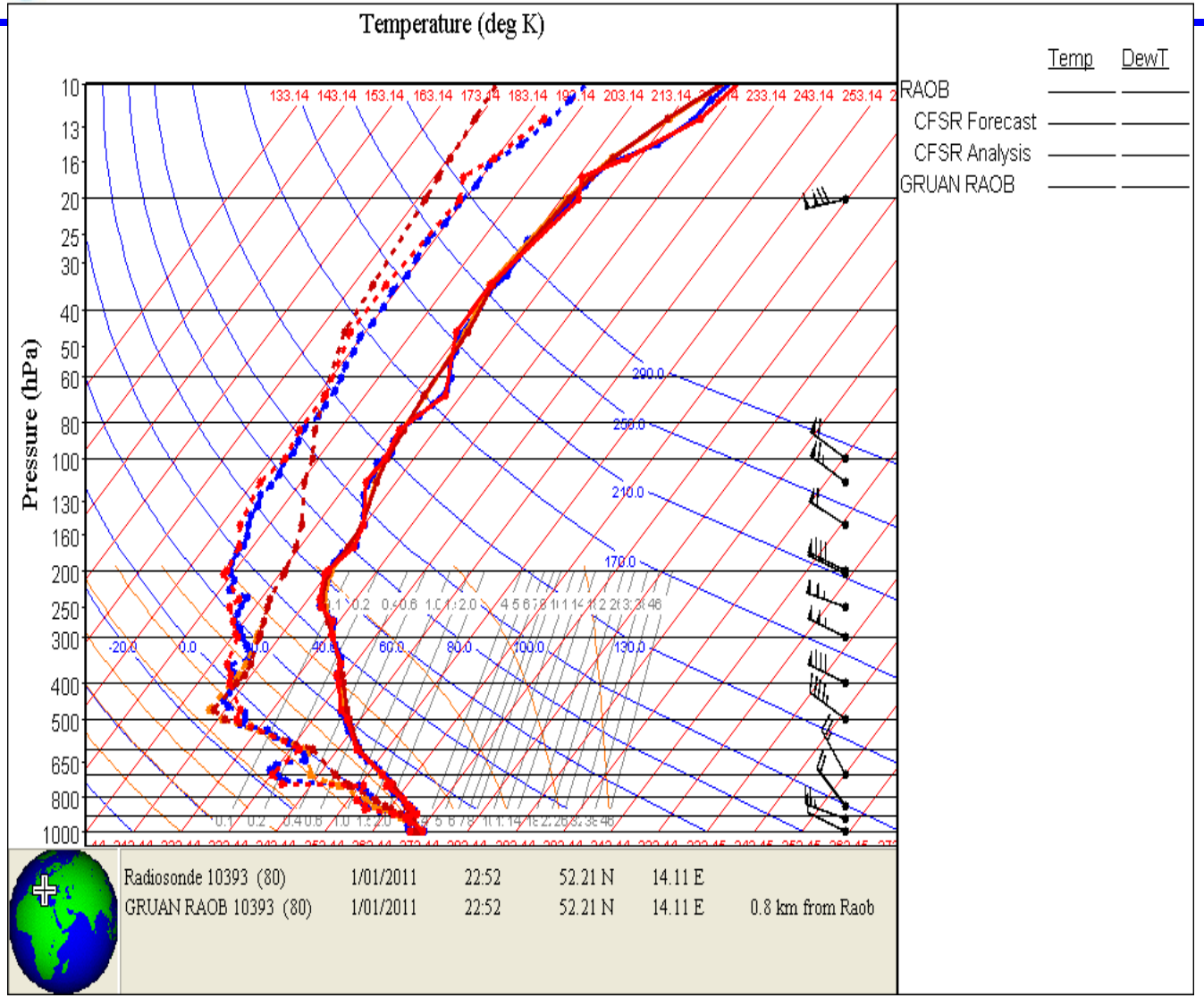
1240 / 1335 / 1397 @ LIN

289 / 310 / 310 @ Tateno


NOAA/NESDIS/STAR Vertical Accuracy Statistics
December 31, 2010 to December 15, 2011
Pressure (hPa)
0.14
0.35
0.71
1.3
2.15
3.34
4.92
8
12
16
23
32
43
56
71
89
110
133
160
190
223
259
300
343
390
441
496
555
617
683
753
827
904
1000
0.394
0.262
0.122
0.049
0.02
0.01
0.0060
0.0030
0.0030
0.0030
0.0010
0.0010
0.0030
0.0050
0.014
0.036
0.096
0.182
0.31
0.51
0.746
1.066
1.516
2.12
3.007
4.137
5.437
6.557
-40
-30
-20
-10
0
10
20
30
40
Water Vapor (sat-baseline) % error: Bias
Sample Size
149
580
644
708
745
773
814
846
893
944
996
1053
1120
1161
1297
1397
1434
1441
1443
1443
1443
1443
1443
1443
1443
1443
Baseline: Selected Profile Mean (inclusive)
RAOB Radiosonde
GRUAN RAOB Radiosonde

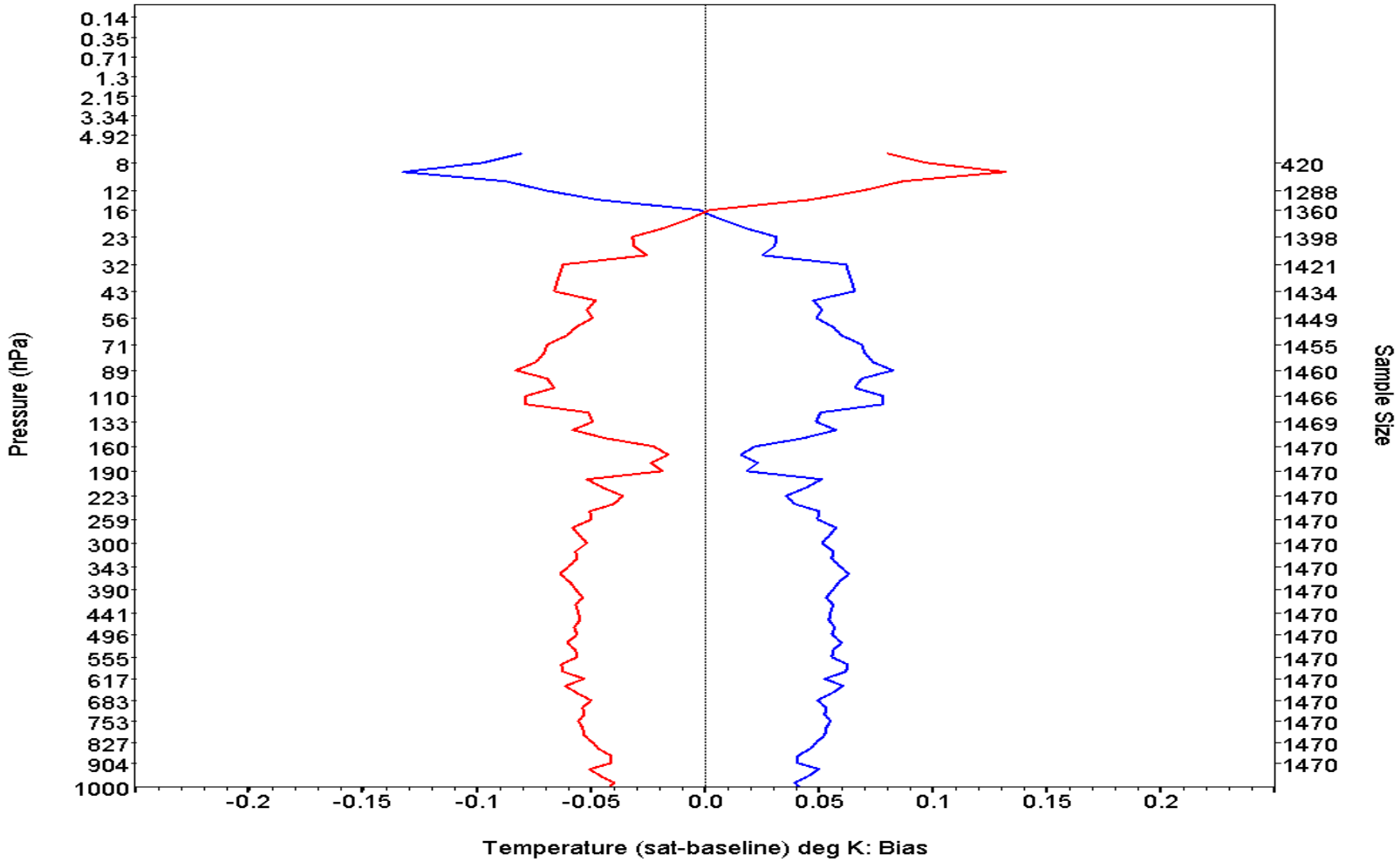

NOAA/NESDIS/STAR Vertical Accuracy Statistics
December 31, 2010 to December 30, 2011
Pressure (hPa)
2.47
7
11
21
45
81
122
156
218
267
329
424
556
651
853
1000
0.076
0.044
0.033
0.011
0.0030
0.0010
0.0010
0.0030
0.015
0.072
0.171
0.475
1.133
1.924
4.79
389
520
718
914
1039
1107
1217
1429
1497
1522
1525
1527
1528
1527
Sample Size
-45
0
45
90
135
180
225
270
315
Water Vapor (sat-baseline) % error: Bias
Baseline: RAOB Radiosonde
RAOB CFSR Forecast
RAOB CFSR Analysis
GRUAN RAOB GRUAN RAOB

NOAA Products Validation System (NPROVS)



NOAA/NESDIS/STAR Vertical Accuracy Statistics

December 31, 2010 to December 20, 2011



Baseline: Selected Profile Mean (inclusive)

RAOB Radiosonde

GRUAN RAOB Radiosonde

Satellite / SASBE

Action

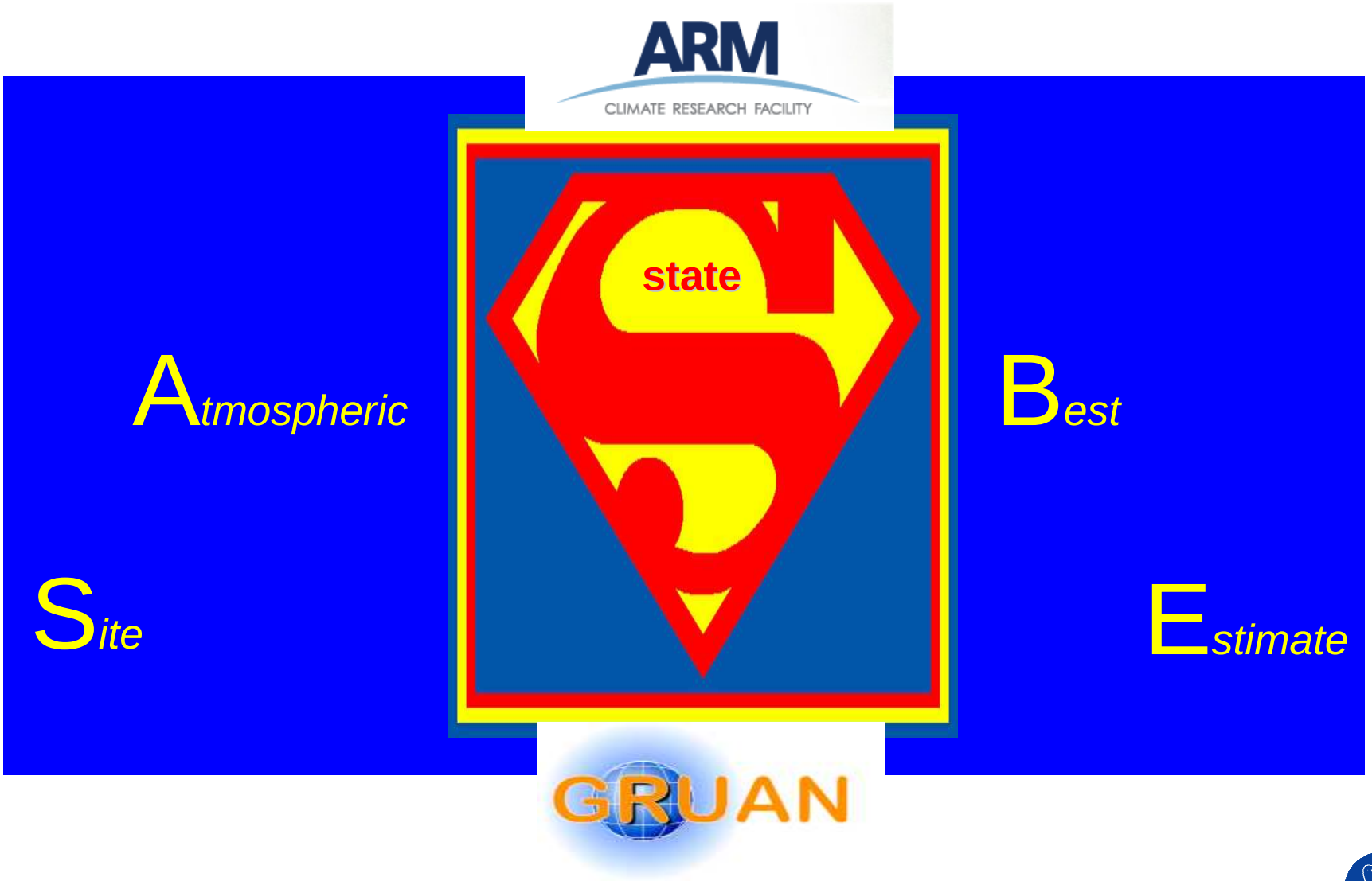
Improved GRUAN / Satellite community interaction facilitated using revised NPROVS interface to supplement NPP satellite products validation at GRUAN sites and fully characterized site atmospheric column from integrated reference sonde and ancillary ground data:

- ARM "site atmospheric state best estimate" (SASBE) for AIRS temperature and water vapor retrieval validation …*Tobin et al., 2006, J. Geophys. Res., 111, D09S14*
- Uncertainty analysis for estimating atmospheric temperature for remote sensing applications … Dykema et al., International Temperature Symposium, March 2012, Los Angeles, Ca.

Coordinate through Task Team for Ancillary Measurement (Lidar, MWR, FTIR … Satellites) to assess best measurement practices, respective product uncertainty, optimal mix (recipe) of products to estimate SASBE and uncertainty and respective site suitability

Coordinate through Task Team for Measurement Scheduling to coordinate site measurements and products for SASBE whenever radiosonde in air particularly for satellite synchronized launches

Coordinate with GRUAN Analysis Team for Network Design and Operations Research (GATNDOR) to support and deploy "tool" to determine measurement compatibility given respective uncertainty estimations and spatial/temporal mismatch a key component of SASBE calculation


ARM
CLIMATE RESEARCH FACILITY
state
Atmospheric
Best
Site
Estimate
GRUAN

CriMSS Performance Specification

Atmospheric Vertical Temperature Profile (AVTP)
Measurement Uncertainty – Layer Average Temperature Error

PARAMETER	THRESHOLD
AVTP Clear, surface to 300 mb	**1.6 K / 1-km layer**
AVTP Clear, 300 to 30 mb	1.5 K / 3-km layer
AVTP Clear, 30 mb to 1 mb	1.5 K / 5-km layer
AVTP Clear, 1 mb to 0.5 mb	3.5 K / 5-km layer
AVTP Cloudy , surface to 700 mb	**2.5 K / 1-km layer**
AVTP Cloudy, 700 mb to 300 mb	1.5 K / 1-km layer
AVTP Cloudy, 300 mb to 30 mb	1.5 K / 3-km layer
AVTP Cloudy, 30 mb to 1 mb	1.5 K / 5-km layer
AVTP Cloudy, 1 mb to 0.5 mb	3.5 K/ 5-km layer

Atmospheric Vertical Moisture Profile (AVMP)
Measurement Uncertainty – 2-km Layer Average Mixing Ratio % Error

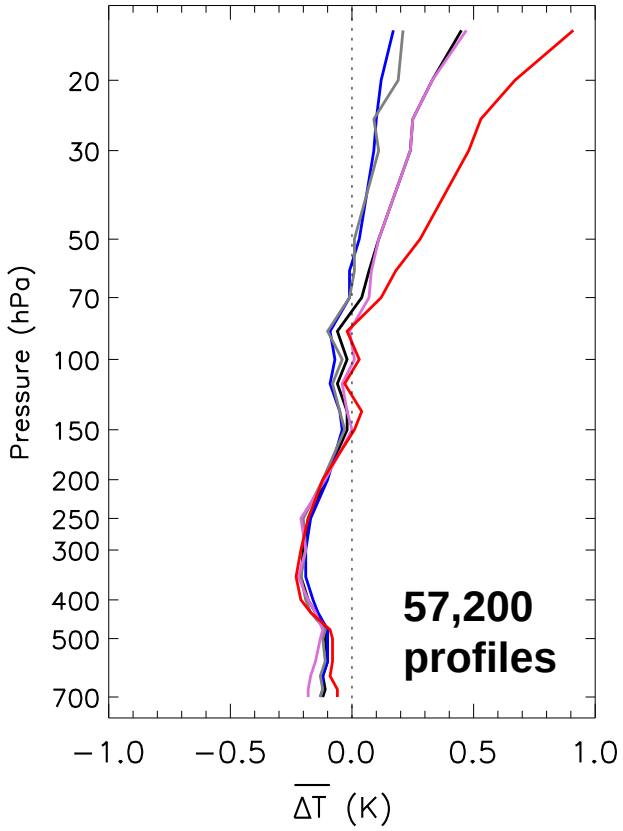
PARAMETER	THRESHOLD
AVMP Clear, surface to 600 mb	**Greater of 20% or 0.2 g/kg / 2-km layer**
AVMP Clear, 600 to 300 mb	Greater of 35% or 0.1 g/kg / 2-km layer
AVMP Clear, 300 to 100 mb	Greater of 35% or 0.1 g/kg / 2-km layer
AVMP Cloudy, surface to 600 mb	**Greater of 20% of 0.2 g/kg / 2-km layer**
AVMP Cloudy, 600 mb to 400 mb	Greater of 40% or 0.1 g/kg / 2-km layer
AVMP Cloudy, 400 mb to 100 mb	Greater of 40% or 0.1 g/kg / 2-km layer

Vaisala RS92

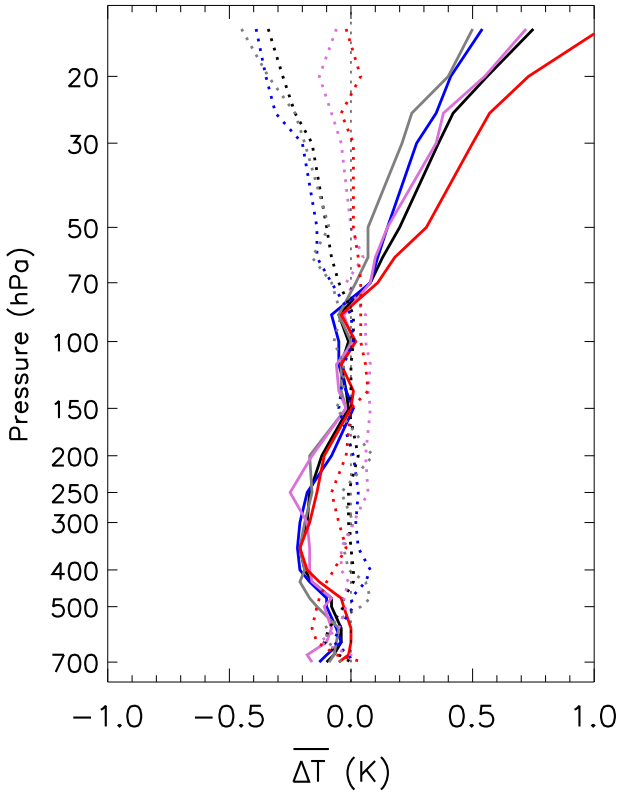
difference from COSMIC T

All
−7.5
−7.5 – 7.5
7.5 – 22.5
22.5

All sample



Summer (solid), winter-minus-summer (dashed)



COSMIC suggests Sonde warmer at night, summer …

CONCLUSION

Task Team 5 (Ancillary Measurement) is now in full gear

Co-chairs Tony anf Thierry will push all TT5 members to attend ICM-5 as it is likely going to be an important milestone for TT5 and GRUAN

Personal suggestion by Thierry

Until today, GRUAN Task Teams have exclusively operated in a "vertical direction". I think it would be beneficial to GRUAN if they operated a bit more "horizontally"

ICM-5 (or any other occasion?) could be the opportunity for TTs to set up short face-to-face meetings where specific overlapping topics of interest would be discussed/addressed efficiently