Task Team Membership:
- No new member since 2014

Lidar:
- ISSI Team work on Uncertainties now published in AMTD (3 manuscripts)
- Data stream: No progress since ICM-7
- Technical document: ongoing, presentation by Thierry tomorrow

Microwave:
- Technical document: ongoing, presentation by Nico Cimini tomorrow

FTIR:
- Technical document: not started, presentation by Jim Hannigan tomorrow
| 34 | Demonstration study of Site Atmospheric State Best Estimate (SASBE) to include impacts of mixes of observations and spatial/temporal mismatch in context of climate monitoring and SAT cal/val; focus on temperature, H2O vapor profile and consistency between (among) respective platforms (AM, SAT, RAOB) to support SASBE calculation. | TT ancillary measurements | April 2016 |

**Action:** Create through appropriate data fusion approaches optimal estimates of the column ECV properties from multiple data streams building upon their respective strengths.

**Who:** Task Team on Ancillary Measurements, Science Coordinators, WG-GRUAN, Lead Centre

**Time-frame:** 2019 for first products, 2021 for more mature set of products

**Performance indicator:** Papers published and such estimators being produced and made available for data arising from GRUAN stations on a sustained basis.

**Benefits:** Better characterization than possible by any single instrument, better understanding of the instruments at GRUAN sites and their performance.

...Dykema, Borg, Jordis, Richard Q...
The call for AM data streams …

**Action:** Develop an average of at least one new data stream per year between 2016 and 2021  
**Who:** Task Teams, Lead Centre, WG-GRUAN, sites, contributing / collaborating networks  
**Time-frame:** By 2021  
**Performance indicator:** For each data product there exists:  
1. A technical document describing how the measurements are to be taken;  
2. A paper describing the traceability and uncertainty quantification;  
3. A centrally processed data stream that is publicly accessible.  
**Benefits:** Improved ability to characterize atmospheric column properties at sites, complementary measurements allow independent verification of adequacy of uncertainty budgets calculated.

**Action:** Deploy data streams as they develop via the data portal and monitor indicators of usage such as publications that use the data.  
**Who:** Lead Centre, Task Teams, sites  
**Time-frame:** Continuous  
**Performance indicator:** Data are publically accessible and there is demonstrable evidence of growing usage within the community.  
**Benefits:** Long-term network utility and viability, return on investment

**Action:** Periodic review of data streams for usage and issues raised  
**Who:** WG-GRUAN, Task Teams, invited experts (as deemed necessary)  
**Time-frame:** Continuous, for any given stream at least once per four years.  
**Performance indicator:** Brief report available on data stream and its usage with any actions required clearly stated.  
**Benefits:** Ensuring that data streams remain cutting edge forcing periodic re-review and (as deemed necessary) reprocessing

**Action:** Undertake research to understand the effects of scheduling for different instruments and end-uses and provide quantitatively based advice on scheduling.  
**Who:** Task Team on scheduling, Lead Centre, WG-GRUAN  
**Time-frame:** Continuous  
**Performance indicator:** Publications and evidence for progress in annual ICM reports, advice dispensed to sites and taken up.  
**Benefits:** Optimal use of observational assets to meet stakeholder needs.

**Action:** Sustained engagement with the user community to ensure usage and exploitation of data arising from GRUAN activities.  
**Who:** WG-GRUAN, Lead Centre, Task Teams  
**Time-frame:** Continuous  
**Performance indicator:** Papers published, presentations given, participation in international activities  
**Benefits:** Ensures usage by expert community to drive value.
A Path Forward

Integrate AM data streams and SASBE

- Respective AM Atmospheric temperature/moisture profiles with uncertainties
- Routine input to NPROVS+ … from clients
- Routine analysis of respective inter-platform (pair) consistency
- SIGMA estimation(s) for respective pairs
- SASBE based on consistent AM profiles including uncertainty (and SIGMA)
  - Climate monitoring
  - Sat Product cal-val
  - RT Model validation
- Scheduling routine AM / RAOB / SAT synchronized observations …
Given two measurements \((m_1, m_2)\), their uncertainties \((u_1, u_2)\) and variability \((\sigma)\), then two observations are consistent if

\[
|m_1 - m_2| < k \sqrt{\sigma^2 + u_1^2 + u_2^2}
\]

\(k\) is determined as

\[
|k| = \frac{|X - \text{GRUAN}|}{u_2}
\]

where \(u_2\) is the GRUAN uncertainty.

In the following plots:

\(k = \frac{|X - \text{GRUAN}|}{u_2}\)

where \(u_2\) is the GRUAN uncertainty.

\[
\sigma^2 + u_1^2 \sim \left(\frac{|k|}{2}\right)^2 - 1 \cdot u_2^2 ; \quad u_1 = a(u_2)
\]

\[
\sigma^2 \sim \left(\frac{|k|}{2}\right)^2 - 1 - a^2 \cdot u_2^2
\]
GRUAN and JPSS funded Dedicated (S-NPP) RAOB Sites
Over 20,000 RAOBS (2000+ Dedicated) available since 2013
Global Climate Observing System (GCOS)
Reference Upper Air Network (GRUAN)

JPSS Funded Dedicated RAOB

- DOE ARM (SGP, NSA, ENA)
  - CIMSS
  - (2) per week
  - GRUAN processed
  - dual vs single, etc

- AEROSE
- CALWATER (El-Nino RR …)
- Sterling Test Site …

GAIA-CLIM Coordinations

EUMETSAT synchronized
(IASI-GRAS)

Synchronized GRUAN
RAOB and GPSRO
(COSMIC, GRAS)
SUMMARY

- Instrument Technical Documents
- Data Streams of AM Atmospheric profiles
- Scheduling routine AM / RAOB / SAT synchronized observations
- Integration into NPROVS+
- Consistency analysis, AM, SASBE, SIGMA
- “3G” support
The GEWEX water vapor assessment (G-VAP)

• Marc Schröder, Maarit Lockhoff

• Special thanks goes to
  • Ralf Bennartz, Frank Fell, John Forsythe, Antonia Gambacorta, Anthony Reale, Remy Roca, Noelle Scott, Lei Shi, Tim Trent, Andi Walther, June Wang, Qiong Yang
Using raman lidar for water vapor

Mean deviation from bestEst

Std deviation from bestEst

Courtesy J Dykema
<table>
<thead>
<tr>
<th>#</th>
<th>Task Description</th>
<th>Responsible Parties</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Technical documentation for GRUAN lidar stream (lidar Guide) submitted for review by WG-GRUAN</td>
<td>TT Ancillary Measurements</td>
<td>Dec 2015</td>
</tr>
<tr>
<td>26</td>
<td>Revise the RS-92 data stream based upon feedback received - revised version 3 release including qc flags vectors and data in different vectors (good, questionable, missing), including implementation of performance feedback. Validate new radiation correction using ancillary measures to build confidence (paper). Document v3 appropriately.</td>
<td>Lead Centre, TT radiosondes, TT ancillary measurements</td>
<td>March 2016</td>
</tr>
</tbody>
</table>
| 4  | Define strategy and necessary steps to undertake transition from RS-92 to another sonde model. Produce GRUAN report on strategy and rationale including interalia:  
  - Sharing the burden  
  - Role of ancillary measurements  
  - Plans for parallel measurements  
  - Ensuring competition in marketplace | Lead Centre, TT radiosondes, TT sites, WMO, GCOS | Oct 2015   |
| 28 | Determine how best to work with NDACC and GAW to bring in measurements of aerosol properties into GRUAN. Produce short document outlining a proposed strategy. | WG Chairs, WG members, TT ancillary measures, Potenza, EARLINET | March 2016 |
Site Atmospheric State Best Estimate (SASBE)

SASBE as a metric for site assessment