GRUAN Related Activities at the Beltsville Site

Ricardo Sakai

G-MAC:

Howard University: Siwei Li, Vernon Morris, Demetrius Venable.
UMBC: Belay Demoz, Kevin Vermeech.
NOAA/NWS: Micheal Hicks, James Fitzgibbon, Daniel Brewer.
NOAA/STAR: Tony Reale, Bomin Sun, Frank Tilley.
Outline

Collaborations and how/why?

Beltsville Site GRUAN data statistics:
  - Archive, Statistics; reaching the 10mb

Lower Altitude Termination:
  - Looking at why we had this problem?

HUBV + NWS/Sterling launches
  - Use for Co-location
  - Auto Sonde testing

CFH launches
  - Progress
  - Collaboration with NDACC
Acknowledgements

• NOAA:
  – MOU being formulated with NWS – HU – UMBC for a stronger collaboration
  – NOAA/STAR (JPSS funds sondes) and
  – Howard Diamond (NCEI) fund the Sonde/CFH flights

• MDE:
  – Standing agreement to run a research grade ground observation site.
  – Ozone monitoring in the Summer

• NGA:
  – MWR and Ozone sonde activity; CRADA with Howard University and UMBC

• NASA:
  – Through a Space-Act agreement with GSFC
  – NDAC collaboration through Dave Whiteman’s grant.
  – Collaboration with A. Thompson on ozone

• HU and UMBC
  – Graduate and under graduate Students at Howard University at Beltsville.
  – Adjunct and affiliated status for Demoz
Beltsville Site data statistics: Archive, Statistics; reaching the 10mb
RS92 launches - history

Burst heights: Statistics followed.

- Summer time sonde burst point is within MD (short distance)
- Winter – reaches Delaware/South NJ.

<table>
<thead>
<tr>
<th>Year</th>
<th>RS92</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>62</td>
</tr>
<tr>
<td>2015</td>
<td>53</td>
</tr>
<tr>
<td>2016</td>
<td>15</td>
</tr>
</tbody>
</table>

MDE:
2015 - No Ozone Sonde launches during high-ozone days in summer.

NGA schedule was operational.
“Burst” level improved!

MW41

MW31 problems

600 g

SHC

All data is submitted to GRUAN LC!
Lower Altitude Termination:

*why we had this problem?*

*We will report to LC any remediation*
Trajectories

“PTU filtering” termination MW41 - red

Red line: Sondes going too far or too fast?
Red line:
• Sondes going too far or too fast?
• It is both.
When Sondes go to fast lead to lower elevation angles faster.

Reduced the number by a lot!

We are making arrangements to solve this soon.
Time Series

Drop out points are in red.

350 g Balloon
CFH launches

- CFH launches started on Oct, 2014
- Frequency ~ once a month
- CFH connected to an I-Met sonde
- Uses 1,200 g balloon
- **RS92 + Ozonesonde (ECC) is launched as well**

- *This is progressing well and following 2 slides are some 1-level QA checks*
We look at individual CFH flights and comparisons.
We look at individual CFH flights and comparisons.

Another example
We look at individual component and variable (comparisons)
- **Collaboration with NDACC**

- through Dave Whiteman effort, we provide data and host the lidar site.

- Example of a preliminary work on MLS (Satellite) and CFH data comparison is shown.

- Plotted are +/-sigma
HUBV + NWS/Sterling launches

Goals:
- Auto-sonde and Improvement in co-location paper (Fasso et al; 2014)
- Satellite retrieval and uncertainty

Details:
- Simultaneous launches
- Daytime
- RS92 in both sites
**Earlier Work indicated**
- $\Delta T$ within 1%; Total vapor (IPW) $\sim$ 1%
- $\Delta q$ as large as 60%!! “reducible envir.” error largest contributor

⇒ **Repeat study using same sonde-type**

---

**Fasso et al 2014: AMT**

<table>
<thead>
<tr>
<th>Source of uncertainty</th>
<th>$\Delta y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total uncertainty</td>
<td>$\Delta$</td>
</tr>
<tr>
<td>Collocation drift</td>
<td>$\Delta$</td>
</tr>
</tbody>
</table>

---

- **Simultaneous RS92 launches will be used in this study.**
- **Requires two ground stations**
Satellite Co-Location and quality check issues

NUCAPS
“Variability”

Working on (SLOW)
• Simultaneous RS92 launch would provide value for co-location.
• A good use of lidar water vapor mixing ratio to define the variability
• Extension to using MWR data
• This work uses 1-ground receiver!
Summary

• Operational:
  – Improvement using MW41 and 600g balloons.
  – On 2016 start using Saturation Humidity Chamber as a round check.

• CFH:
  – Good agreement among pressure, air temperature, and wind.
  – CFH and RS92 humidity is ok, but differences in high altitudes, probably due to air temperature differences between RS92 and I-Met. RS92 shows a dry bias at high altitudes.
  – I-Met and RS92 inter-comparison not that great.

• Sterling, HUBV synchronized launches:
  – Good agreement among pressure, air temperature.
  – Wind is ok for u-component, but some inconsistency in v-component.
  – Relative Humidity shows the poorest results.
    • Sterling soundings showing a drier bias in the stratosphere.
    • Differences within the PBL, principally when air is “stagnant”
Science Question 2: Is the inconsistency in surface wind speed trend reflected in the upper levels?

Trend Intercomparison, Sterling Va, NWS (1979-2012)

Large STD Error Bar around 200 hPa
**Sium 2016**: Is the inconsistency in surface wind speed change reflected in the upper levels?

**Take home message is**
- Models have similar form
- Large difference from observation
- Large model-to-model variation in the stratosphere