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.

NASA/GSFC: David Whiteman. Monique Walker.

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

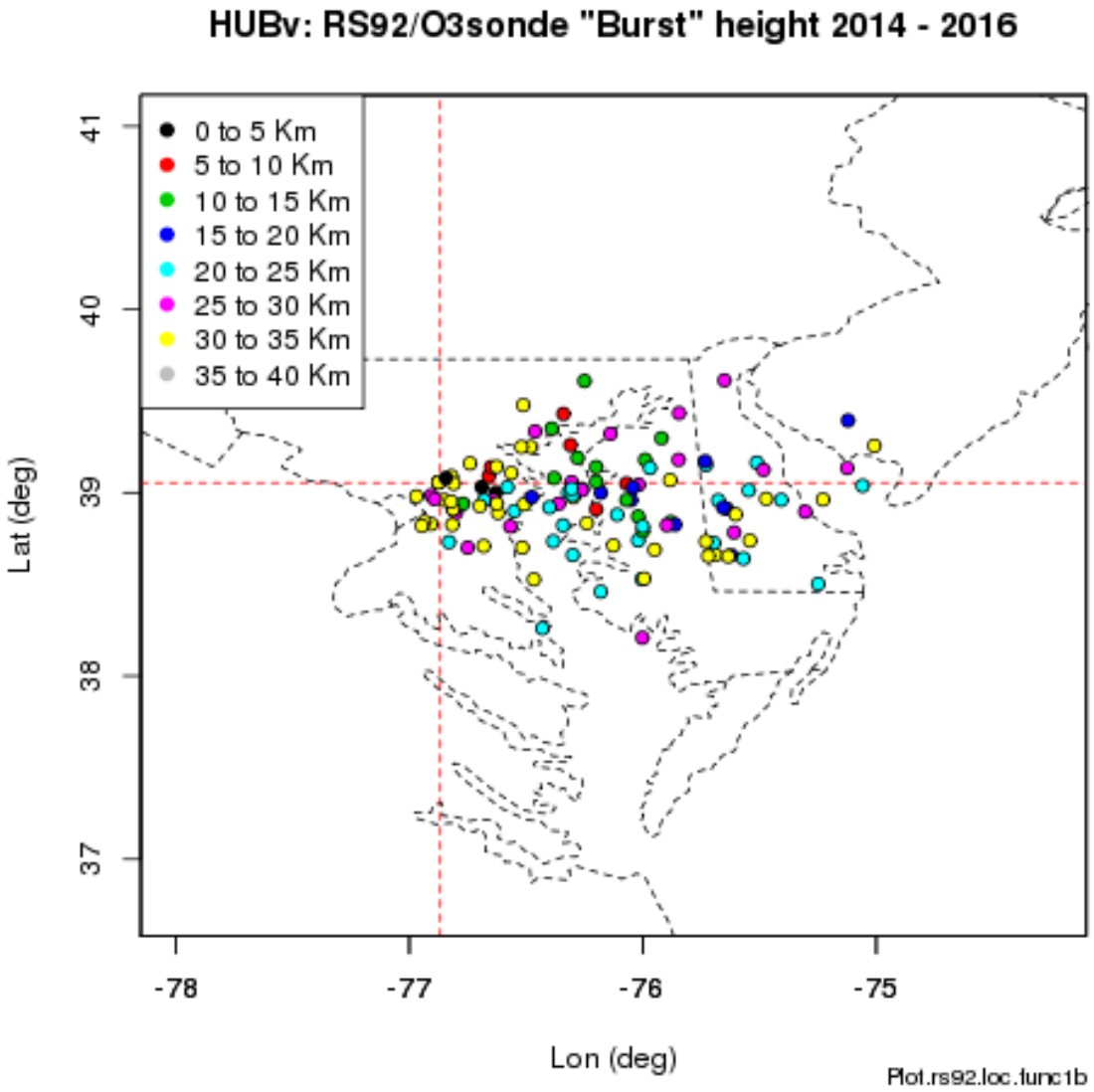
- *Progress*
- *Collaboration with NDACC*

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

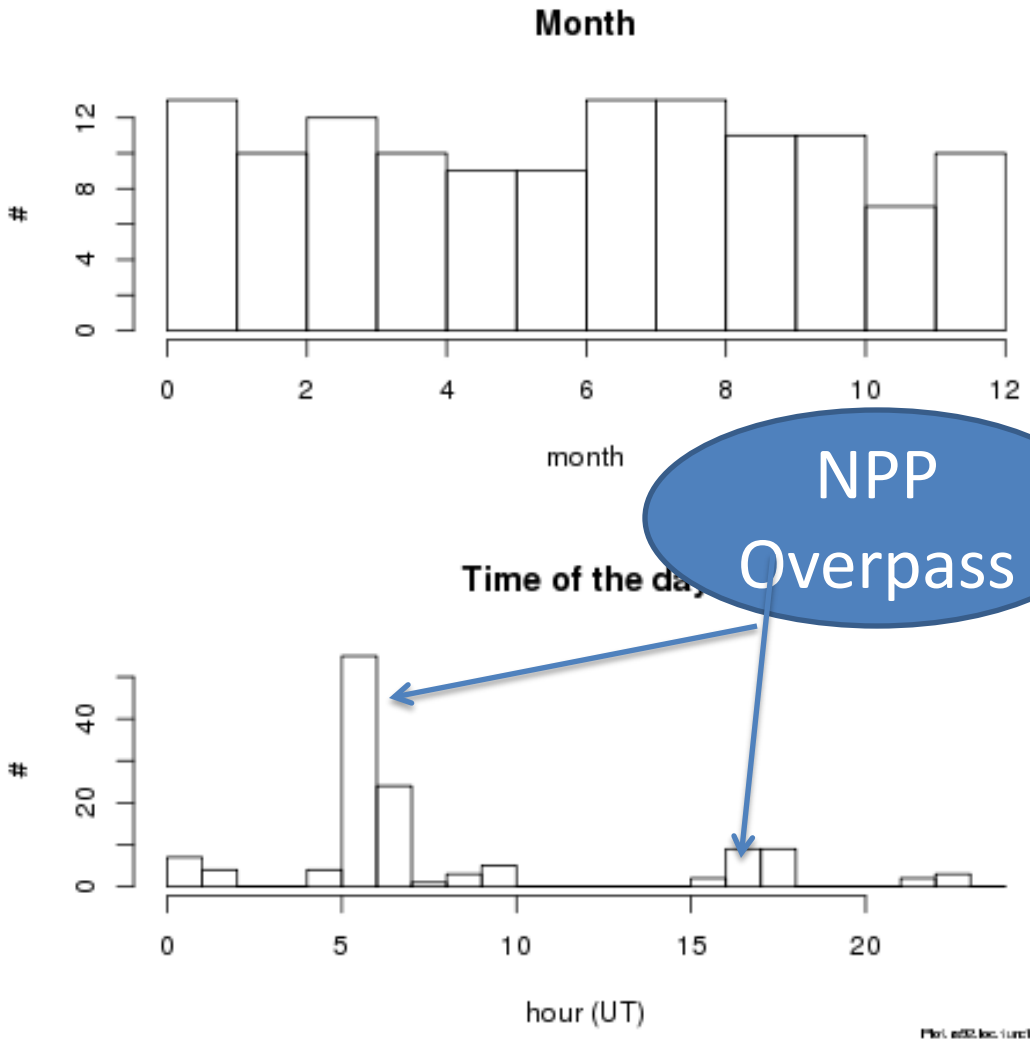


Burst heights: Statistics followed.

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

Sonde Stats: 2014-2016

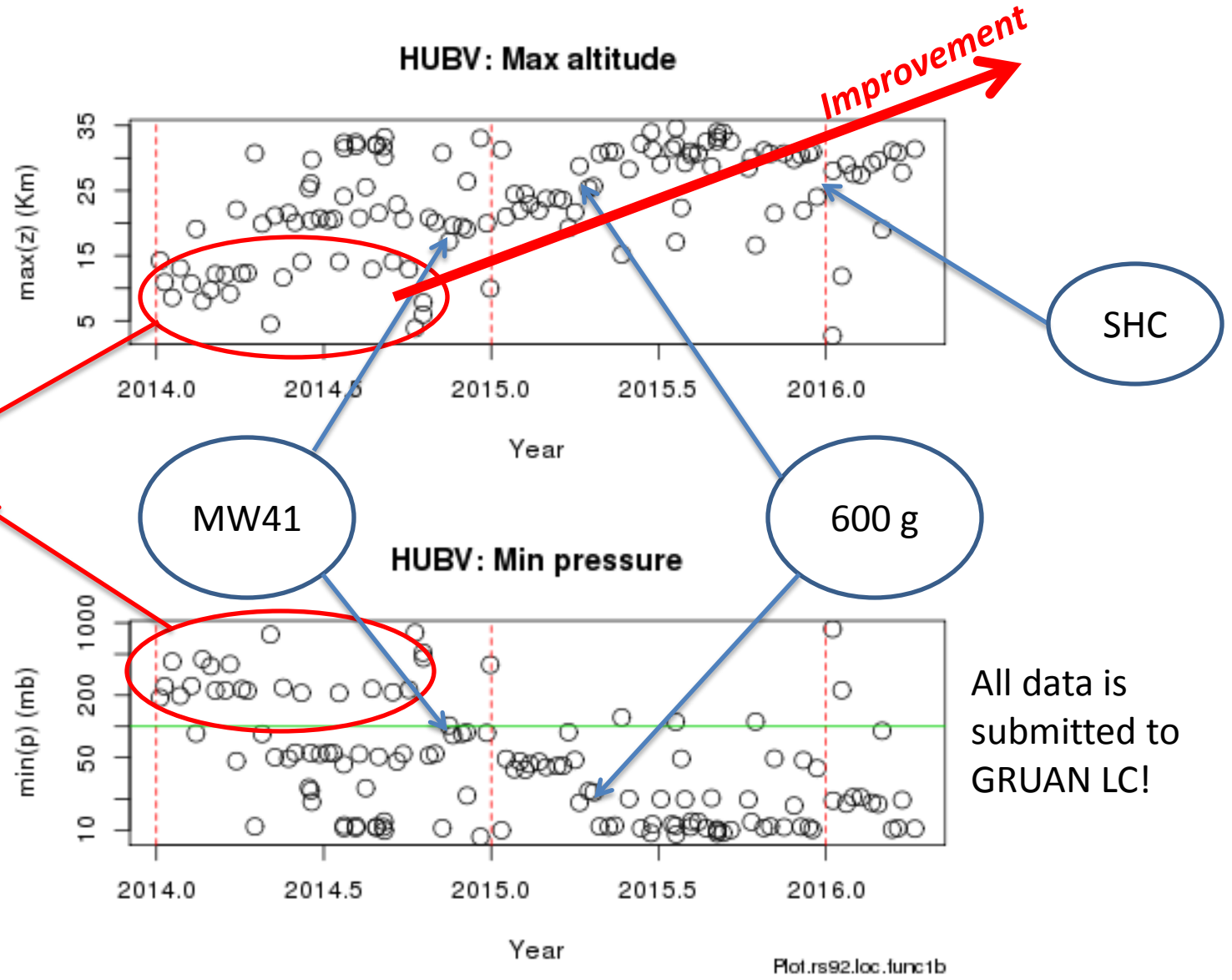
Year	RS92
2014	62
2015	53
2016	15



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

NGA schedule was operational.

“Burst” level improved!



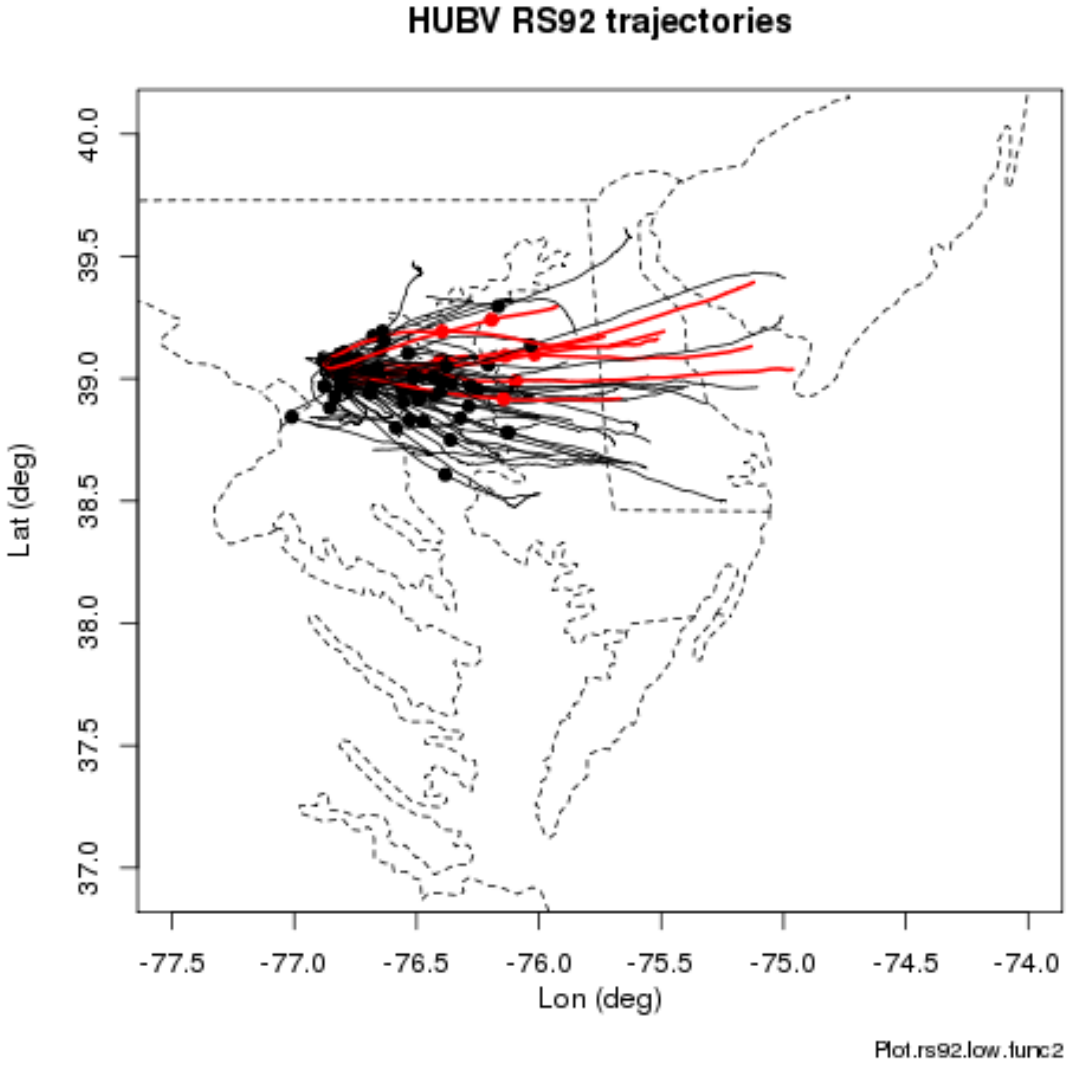
All data is submitted to GRUAN LC!

Lower Altitude Termination:

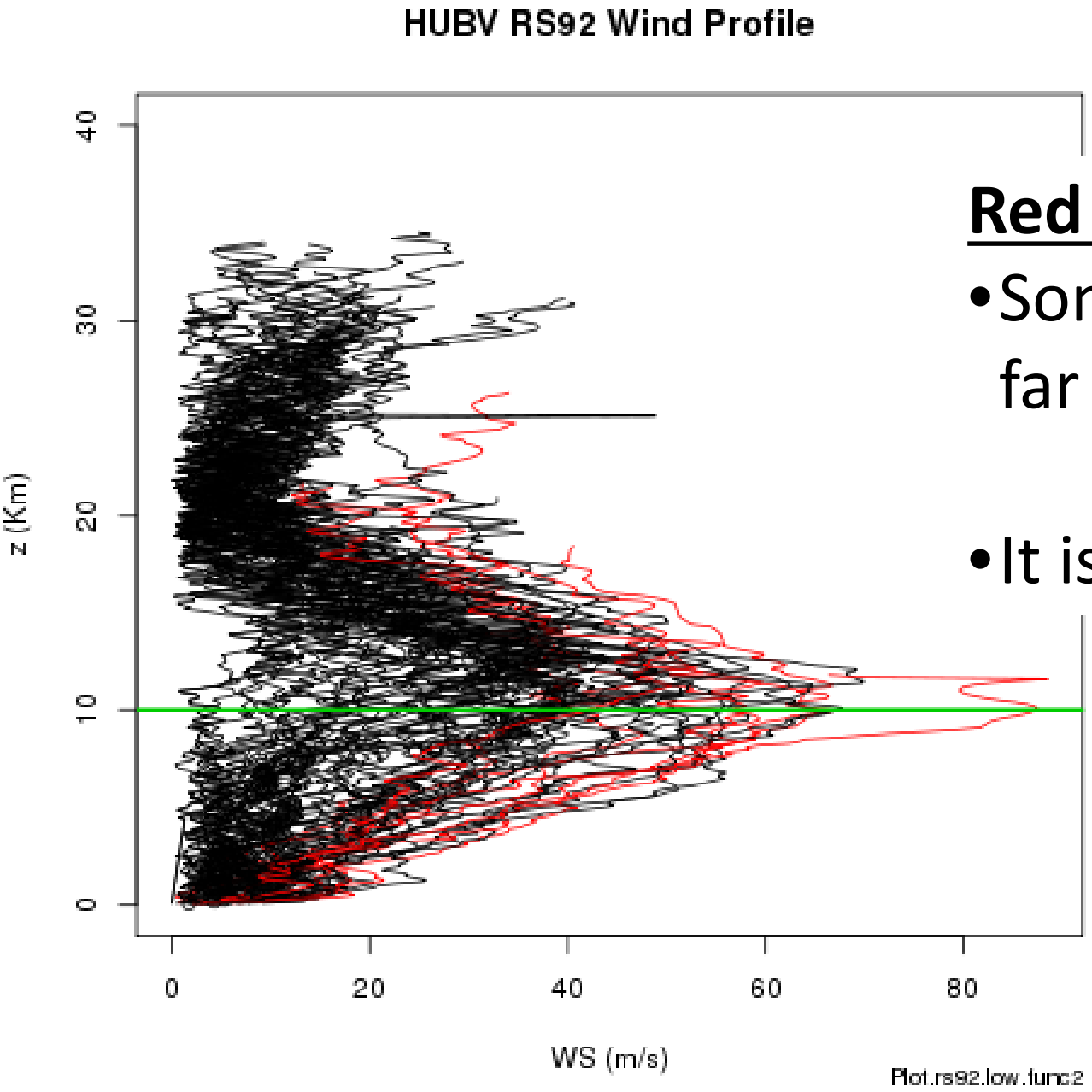
why we had this problem?

We will report to LC any remediation

Trajectories
“PTU filtering” termination MW41 - red

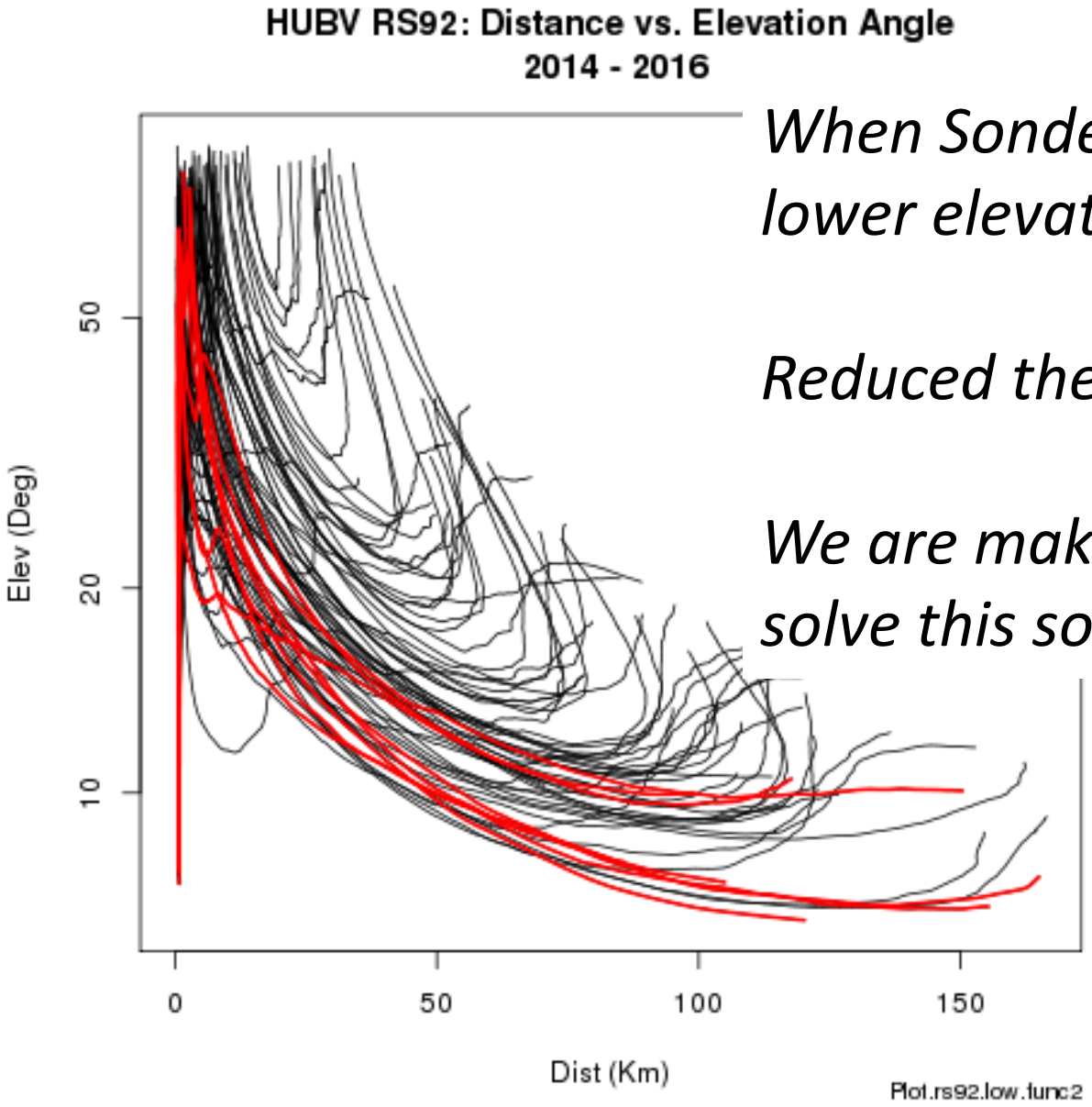


Red line:
Sondes going too far or too fast?



Red line:

- Sondes going too far or too fast?
- It is both.

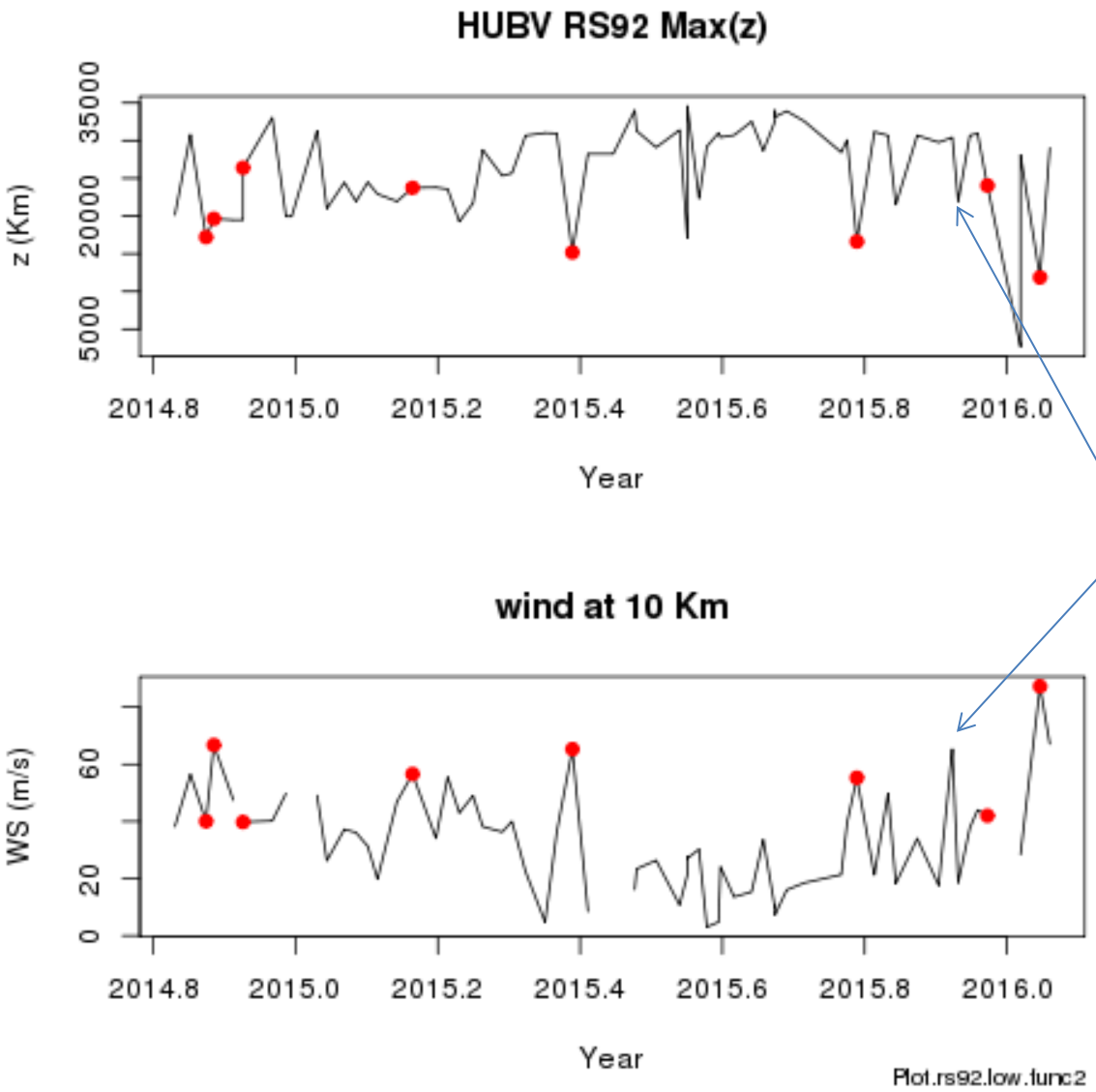


When Sondes go to fast lead to lower elevation angles faster.

Reduced the number by a lot!

We are making arrangements to solve this soon

Time Series



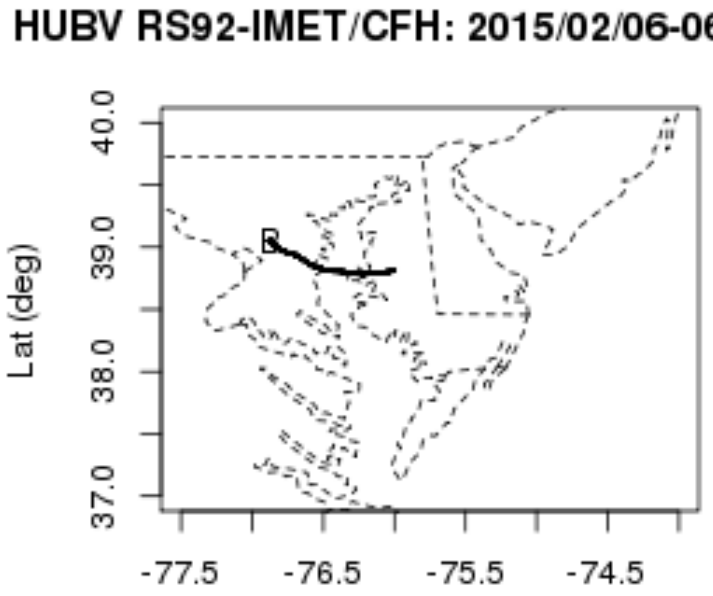
Drop out points are in red.

350 g Balloon

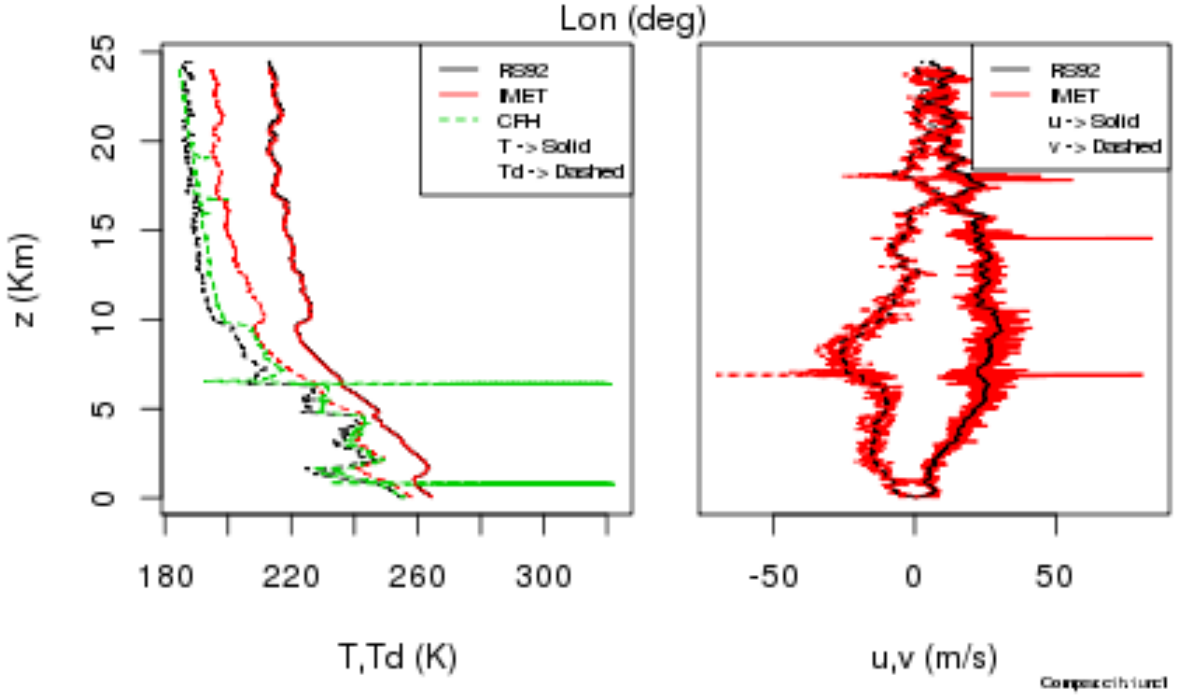
CFH launches

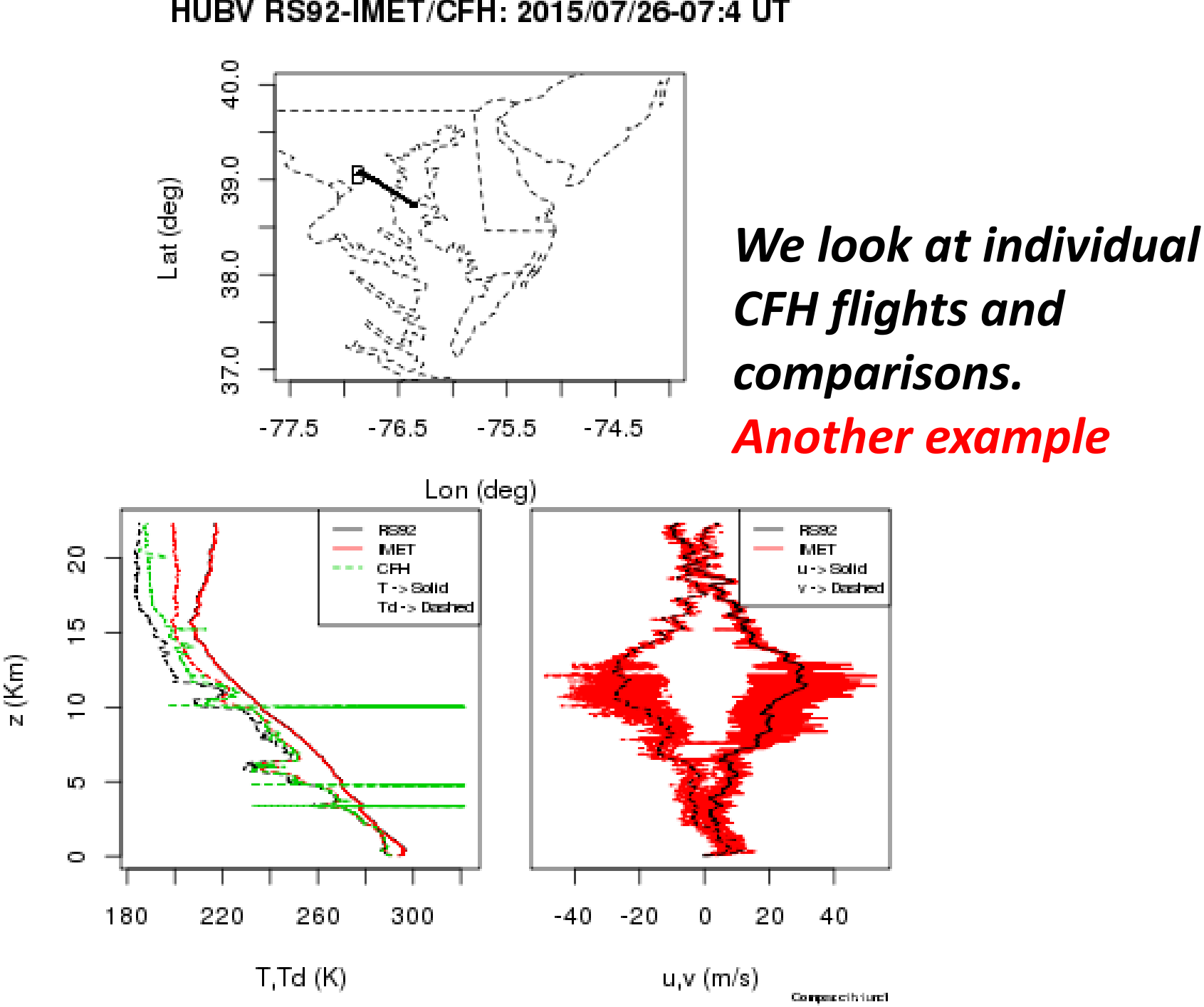
- CFH launches started on Oct, 2014
- Frequency ~ once a month
- CFH connected to an I-Met sonde
- Uses 1,200 g balloon
- **RS92 + Ozonesonde (ECC) is launched as well**

- *This is progressing well and following 2 slides are some 1-level QA checks*



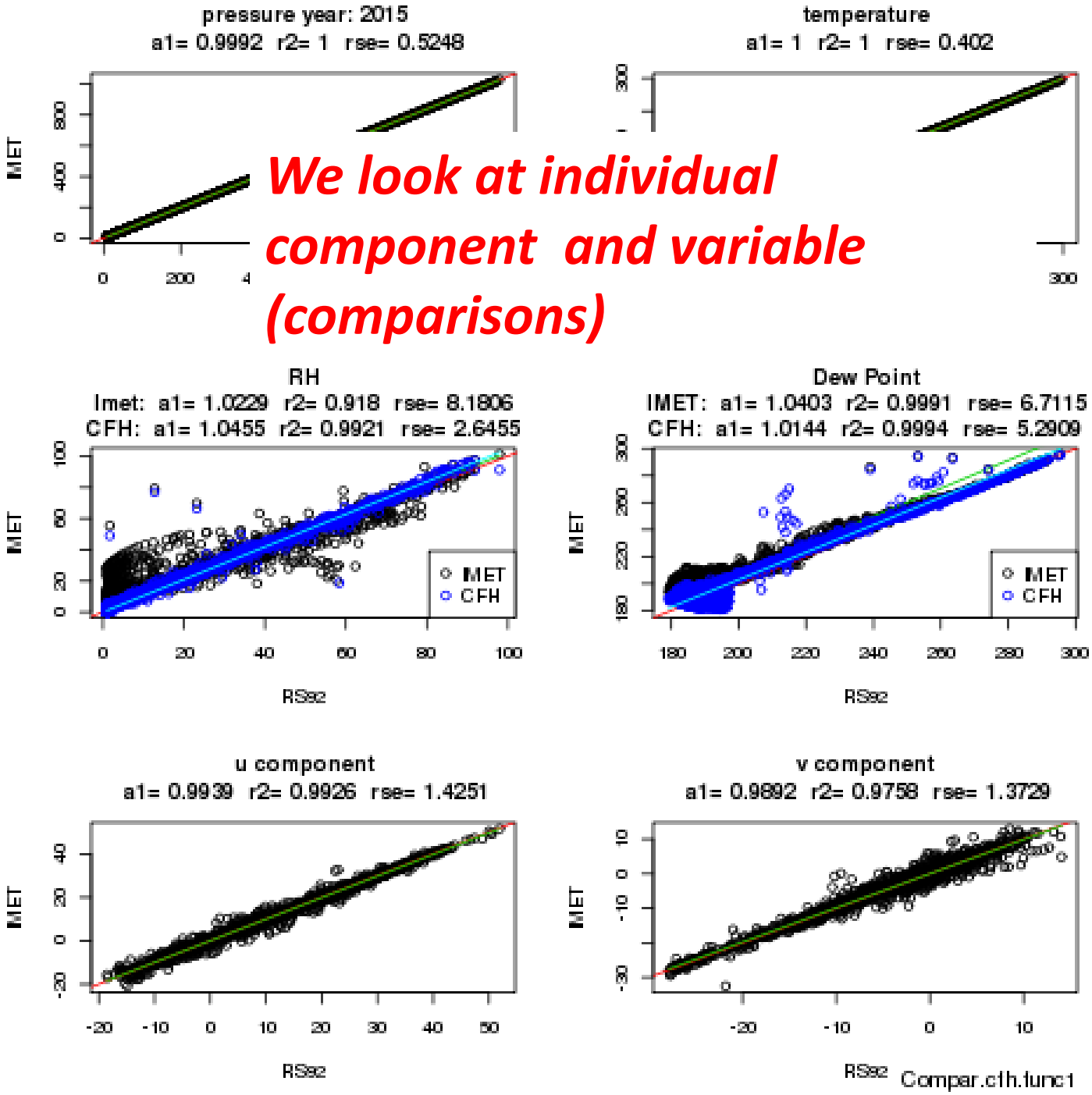
We look at individual CFH flights and comparisons





We look at individual CFH flights and comparisons.

Another example

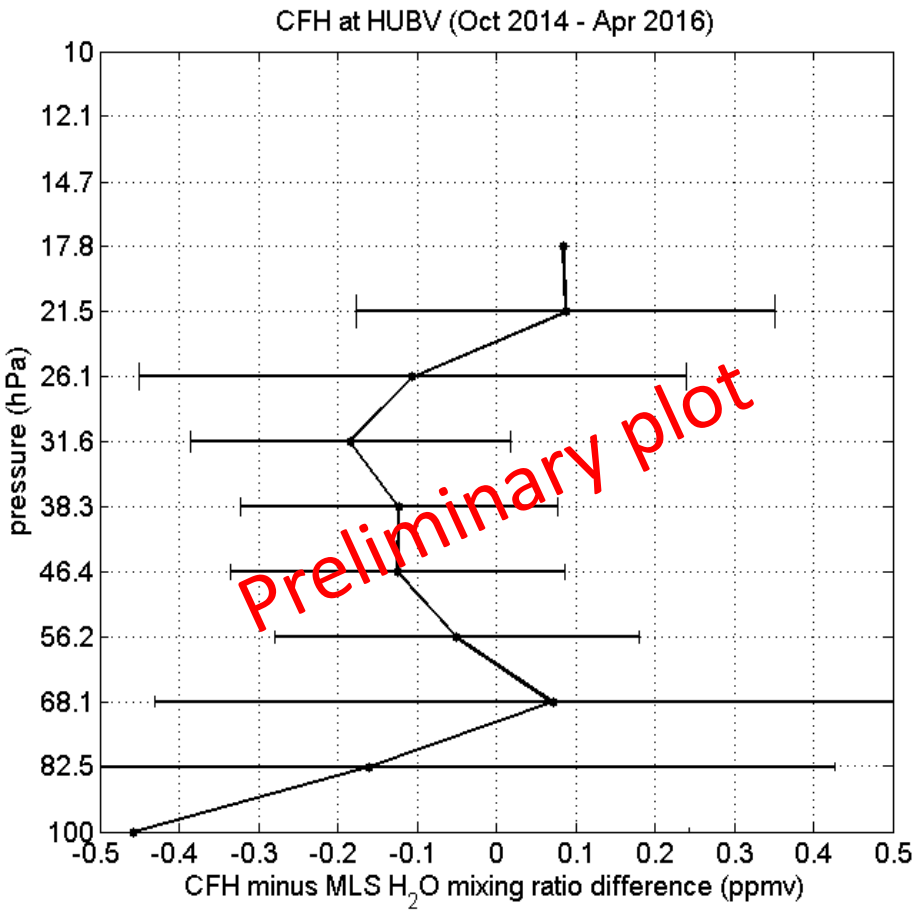

pressure year: 2015
a1= 0.9992 r2= 1 rse= 0.5248
temperature
a1= 1 r2= 1 rse= 0.402
MET
RSe2
We look at individual component and variable (comparisons)
RH
Imet: a1= 1.0229 r2= 0.918 rse= 8.1806
CFH: a1= 1.0455 r2= 0.9921 rse= 2.6455
Dew Point
IMET: a1= 1.0403 r2= 0.9991 rse= 6.7115
CFH: a1= 1.0144 r2= 0.9994 rse= 5.2909
u component
a1= 0.9939 r2= 0.9926 rse= 1.4251
v component
a1= 0.9892 r2= 0.9758 rse= 1.3729
Compar.clh.func1

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

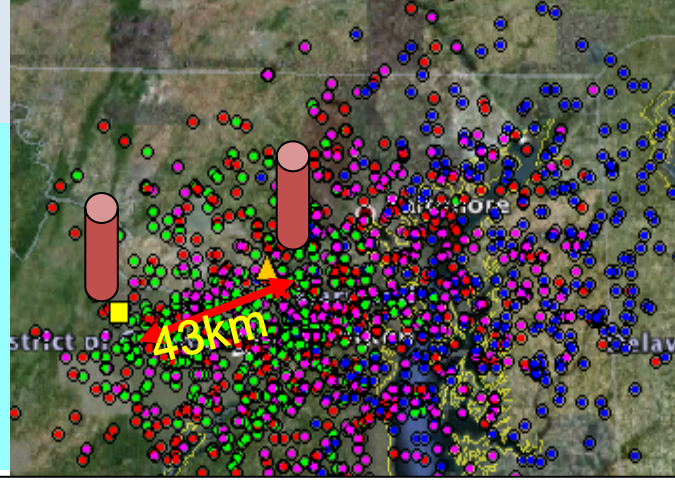
2-Measurement Co-location issues

Earlier Work indicated

- ΔT within 1%; Total vapor (IPW) ~ 1%

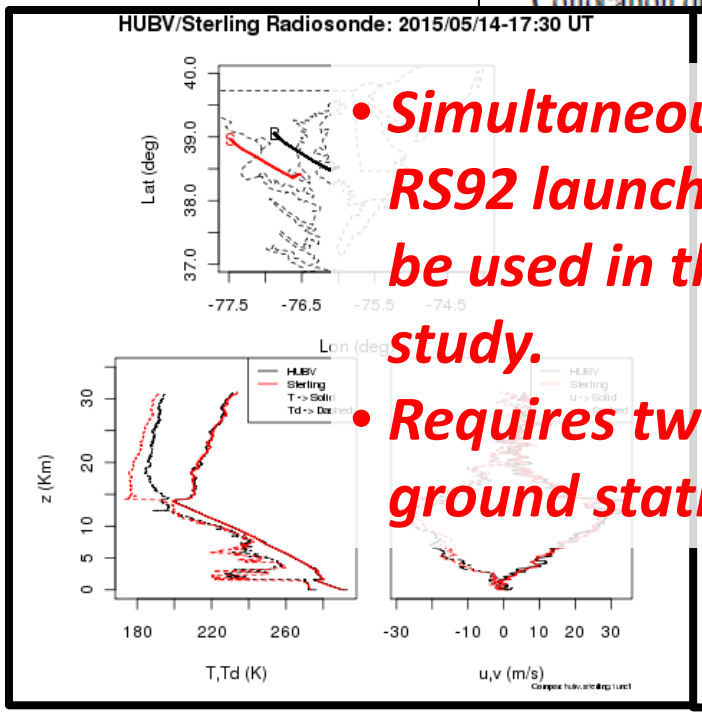
- Δq as large as 60%!! *"reducible envir." error* largest contributor

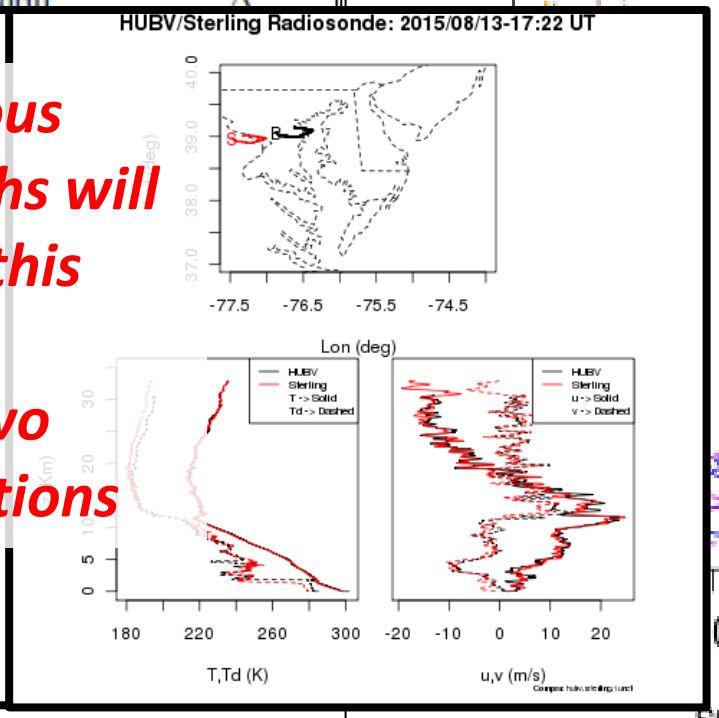
➔ ***Repeat study using same sonde-type***



Fasso et al 2014: AMT

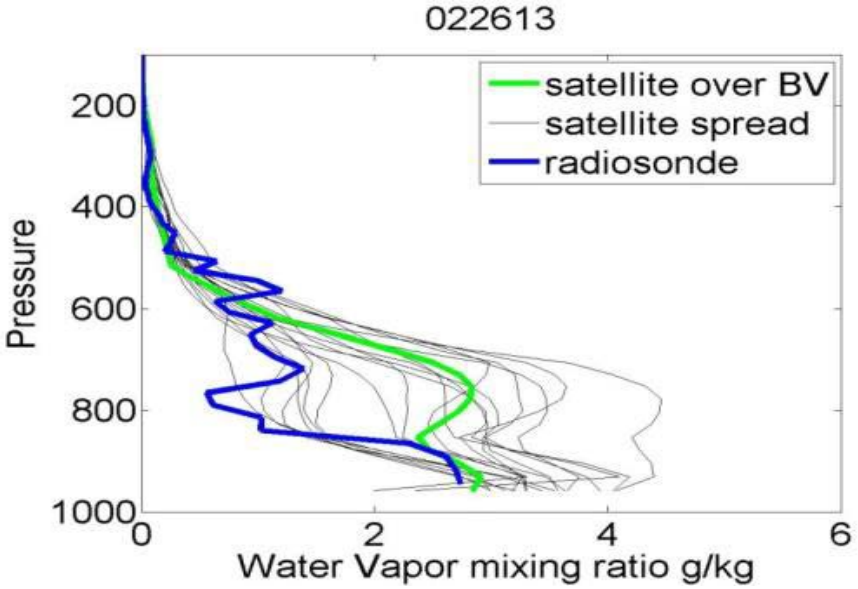
Source of uncertainty	
Total uncertainty	Δ_y
Collocation drift	Δ

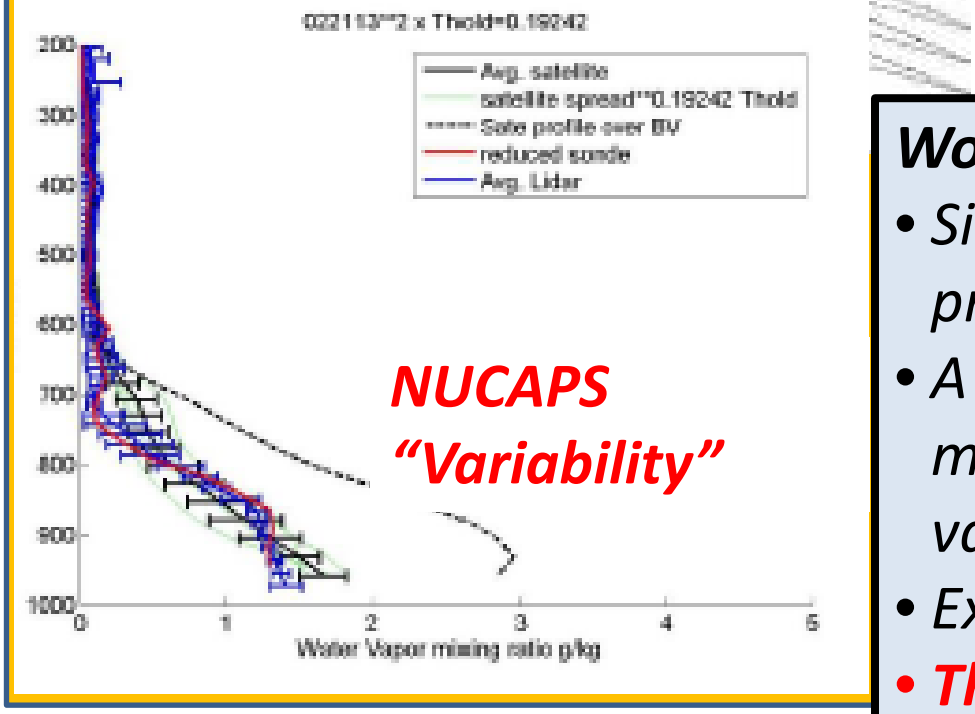




- ***Simultaneous RS92 launchs will be used in this study.***
- ***Requires two ground stations***

Satellite Co-Location and quality check issues





NUCAPS
"Variability"

Working on (SLOW)

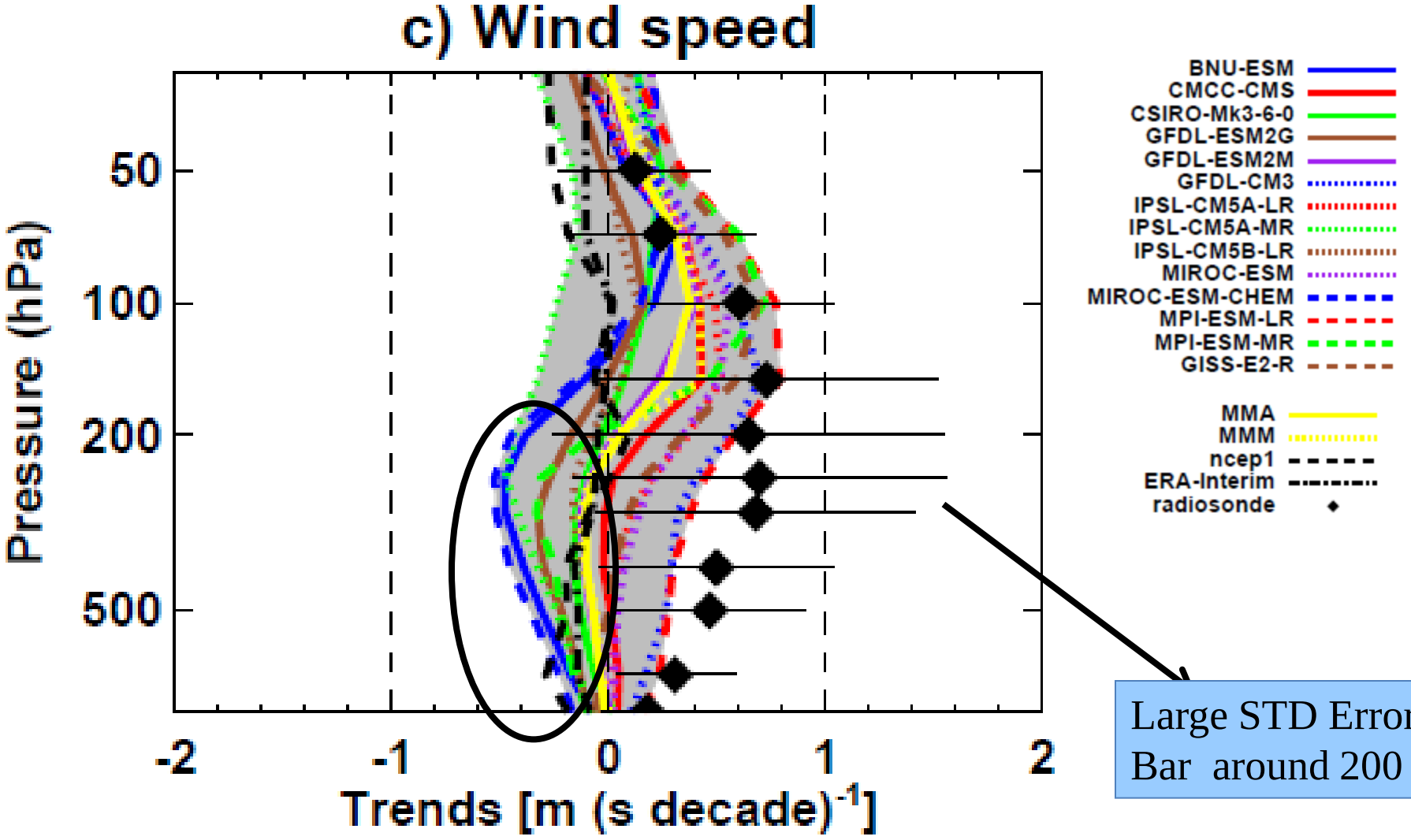
- *Simultaneous RS92 launch would provide value for co-location.*
- *A good use of lidar water vapor mixing ratio to define the variability*
- *Extension to using MWR data*
- ***This work uses 1-ground receiver!***

Summary

- Operational:
  - Improvement using MW41 and 600g balloons.
  - On 2016 start using Saturation Humidity Chamber as a vround 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”

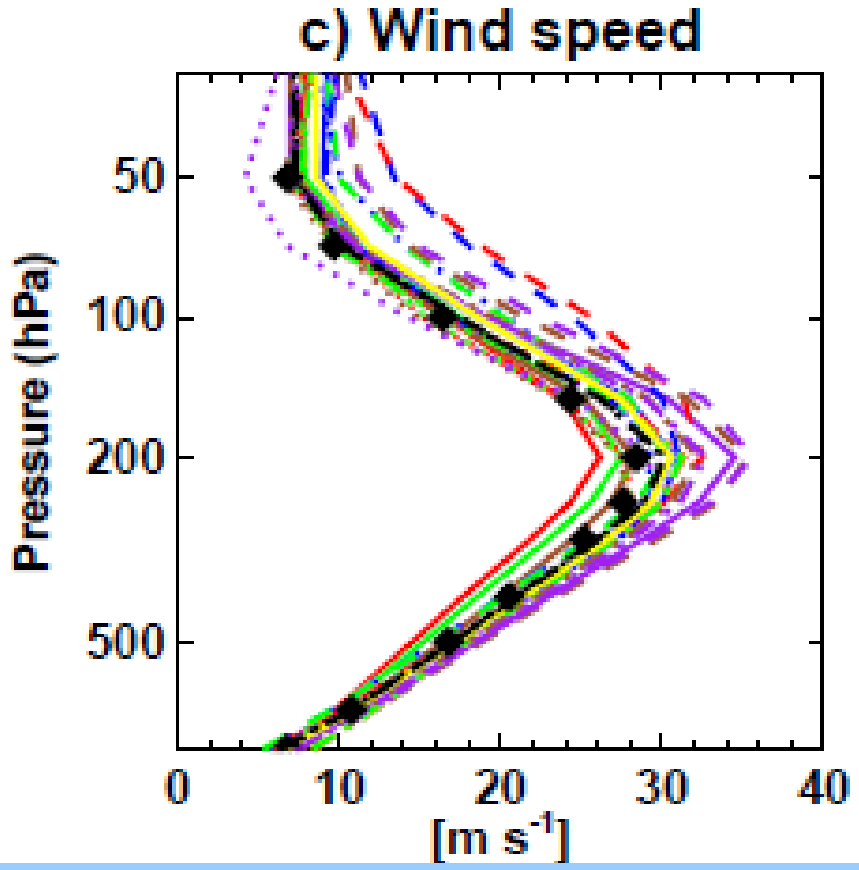
Science Question 2 : Is the inconsistency in surface wind speed trend reflected in the upper levels ?

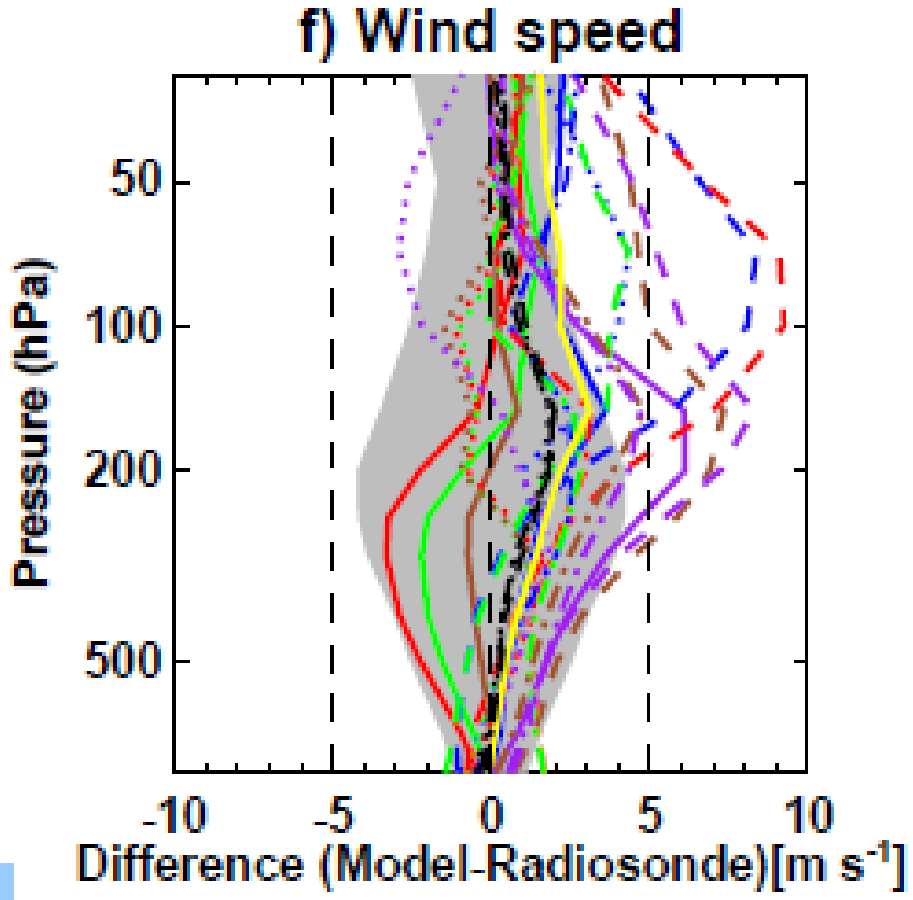
Trend Intercomparison, Sterling Va, NWS (1979-2012)



Large STD Error Bar around 200 hPa

Sium2016: 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

-MR
3-LR
ESM
HEM
M-LR
-MR
E2-R
MMA
MMM
ncep1
ERA-Interim
radiosonde