Comparisons of VCSEL and AIRS/AMSU-A on water vapor and temperature in HIPPO#1

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Photo by Minghui Diao

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Introduction

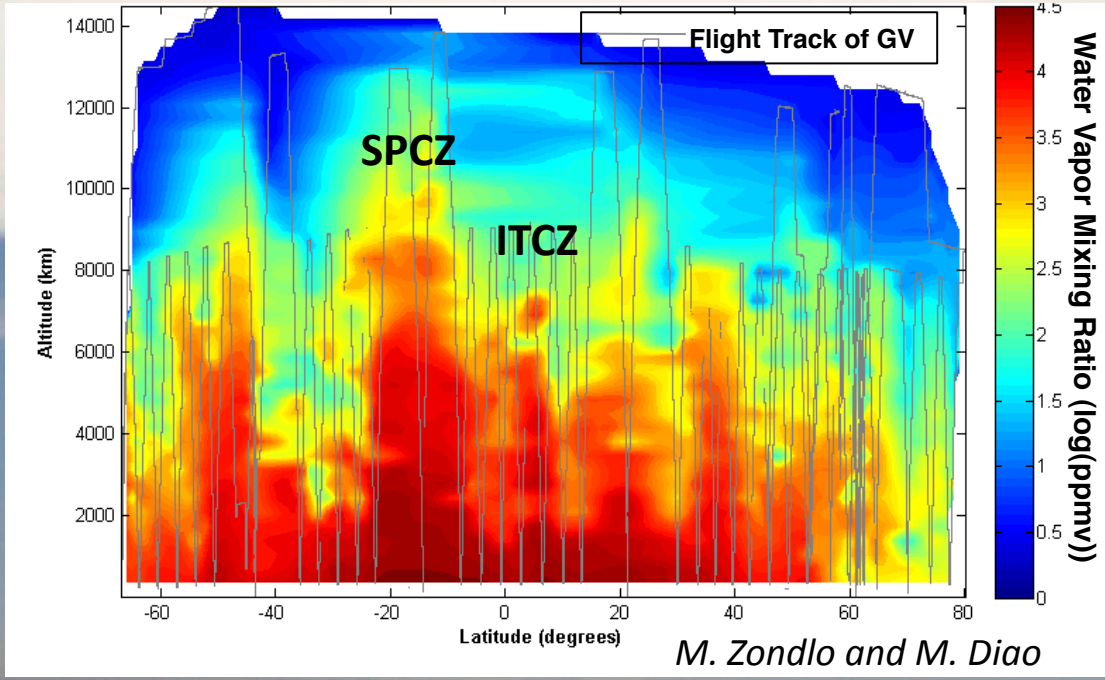
Motivation – Why do we compare *in situ* measurement with AIRS/AMSU-A data?

1. Routine assessment to ensure validity and confirm improvements
2. HIPPO - A unique dataset to assess AIRS observation
3. AIRS has large temporal and spatial coverage

Difficulties:

1. Different spatial/temporal resolutions
2. Algorithm to choose "closest" points

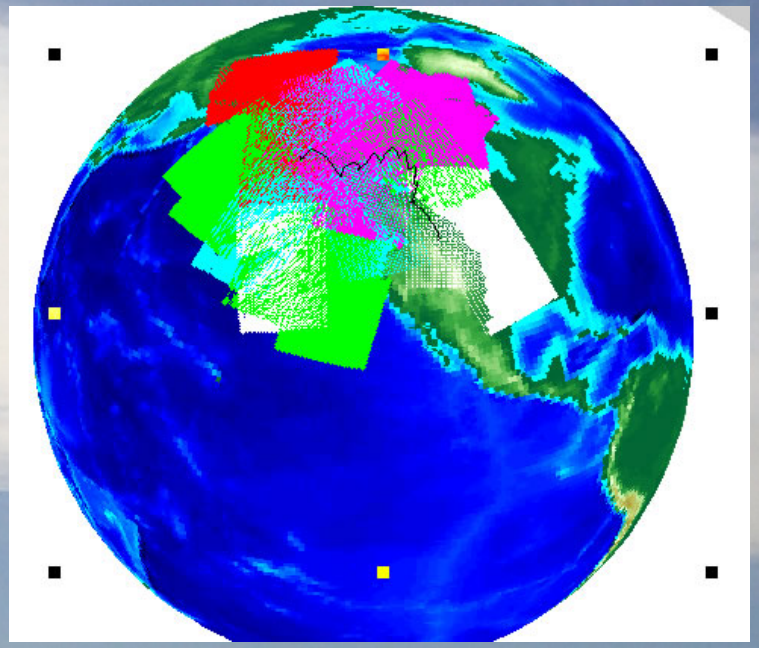
HIPPO#1 Water vapor distribution



M. Zondlo and M. Diao

HIPPO#1 RF2 AIRS granules

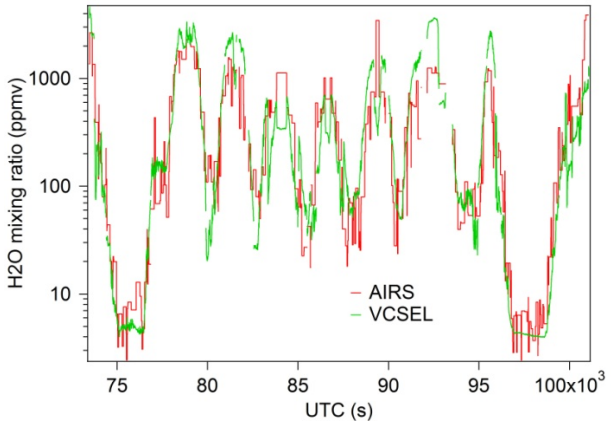
Version 5, level-2 standard products

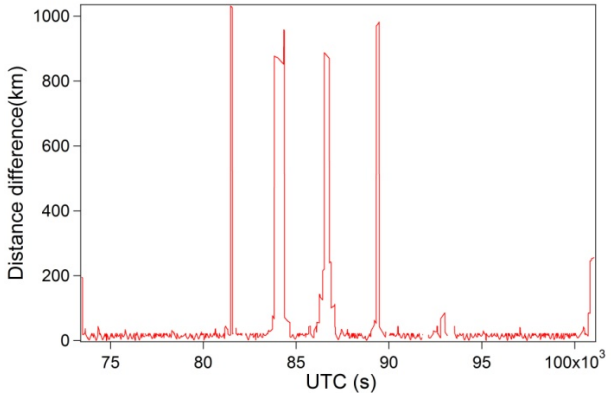


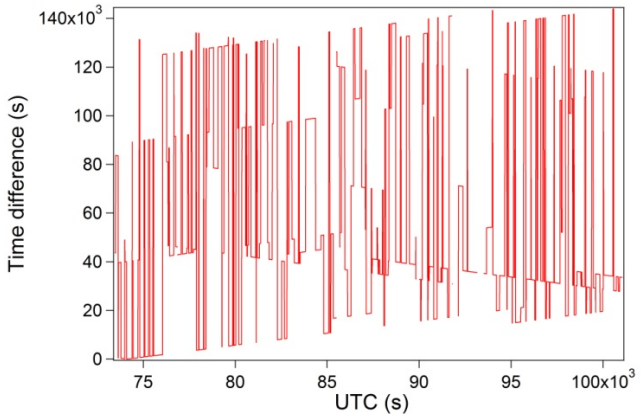
+/- 1.5 days +/- 0.5 degrees

Time series comparison of HIPPO#1 RF2

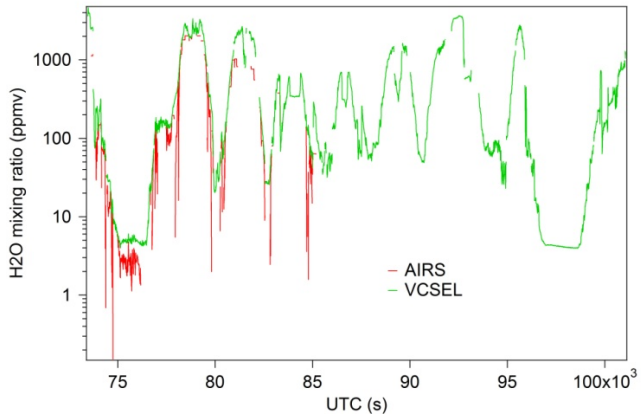
Algorithm 1

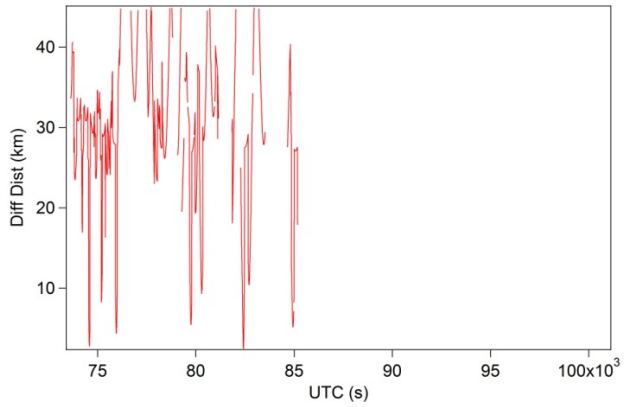


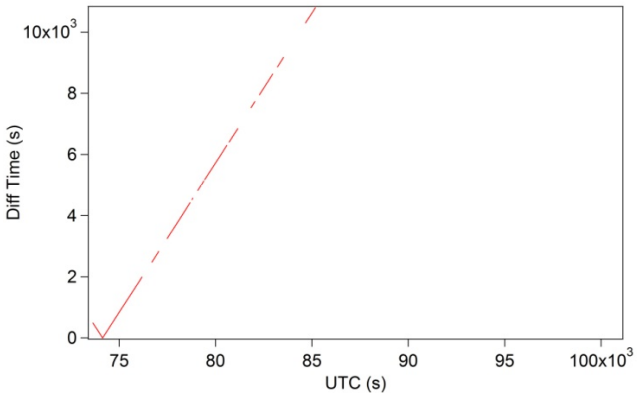




Algorithm 2







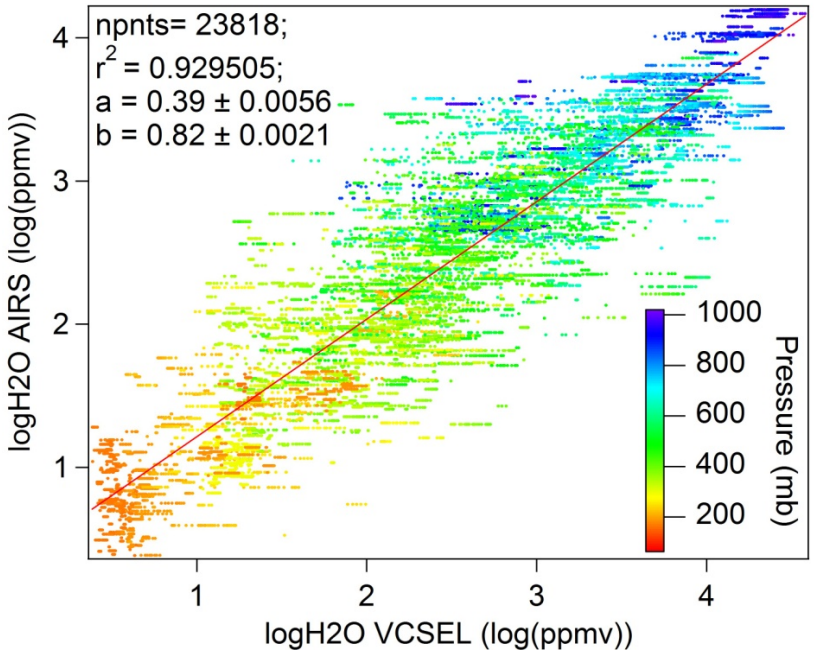
- **H2O quality control**
- Delete:
  - Qual_H2O=2
  - H2OMMRStdErr
  > 0.5 (Olsen *et al*, 2007).
  - P > PBest

- **Algorithm 1**
  Best 1 point
  1. ± 22.5 km bin
  2. Sort by time
  3. Keep searching
  ± 22.5*i km, i = 1,2,3

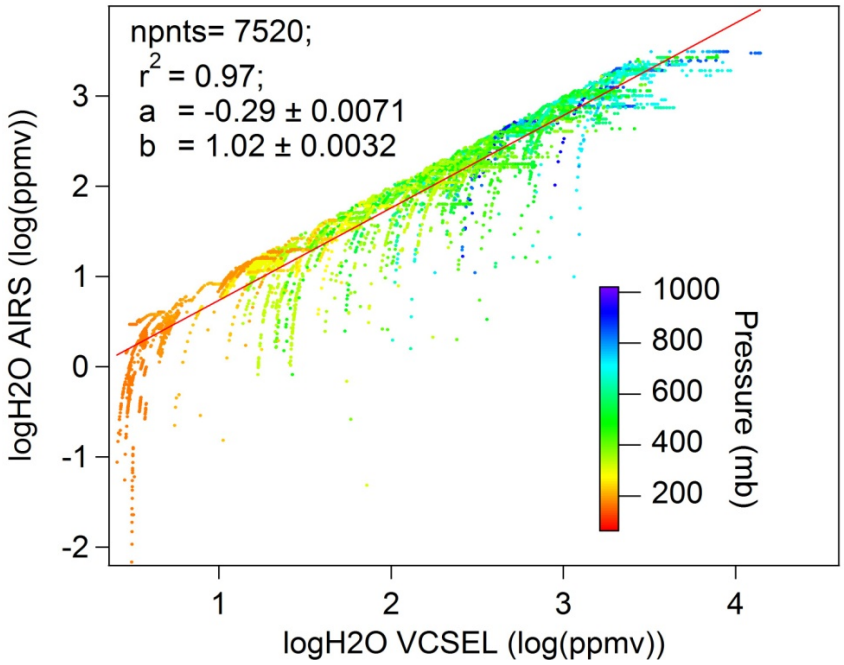
- **Algorithm 2**
  Average window
  – ± 45 km
  – ± 3 hrs

HIPPO#1 RF1 to RF7

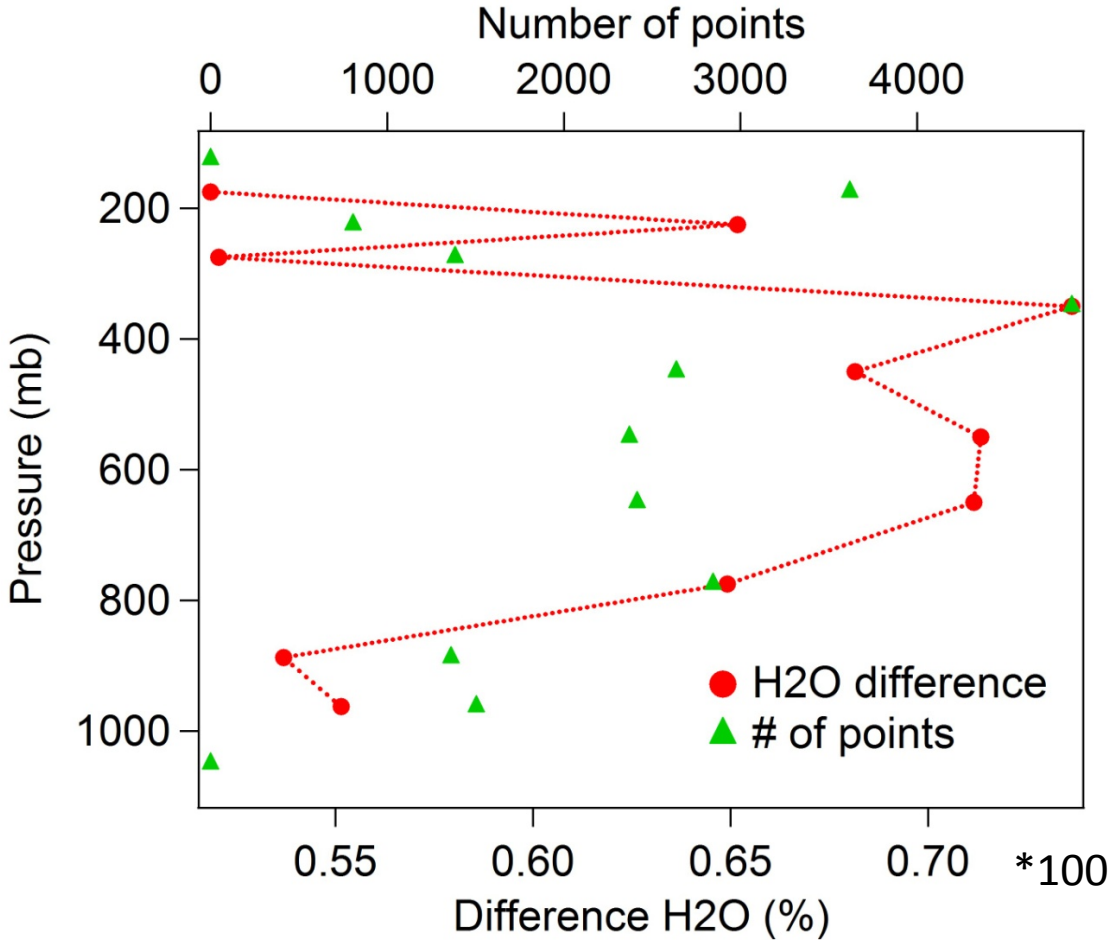
Algorithm 1



Algorithm 2

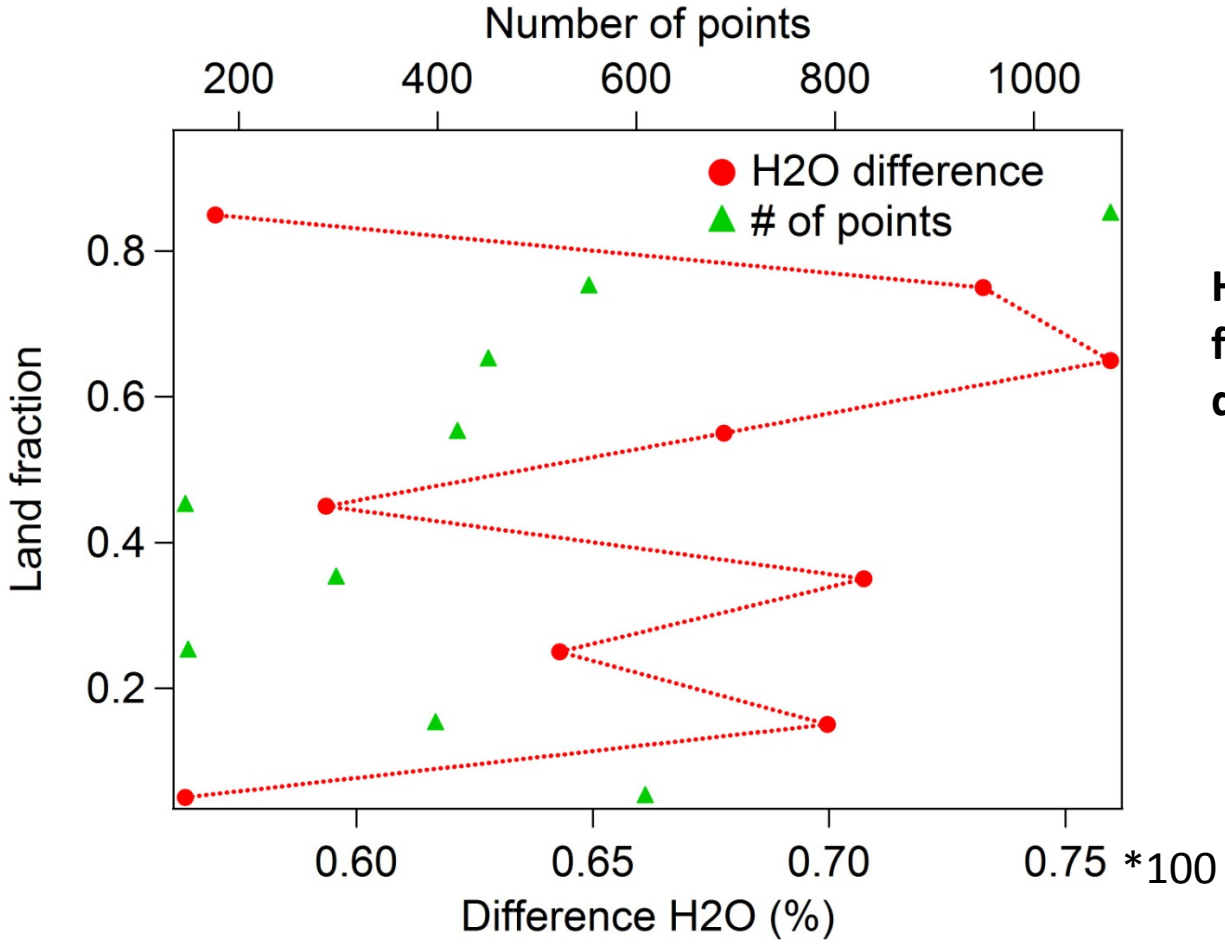


Algorithm 1 - Pressure level



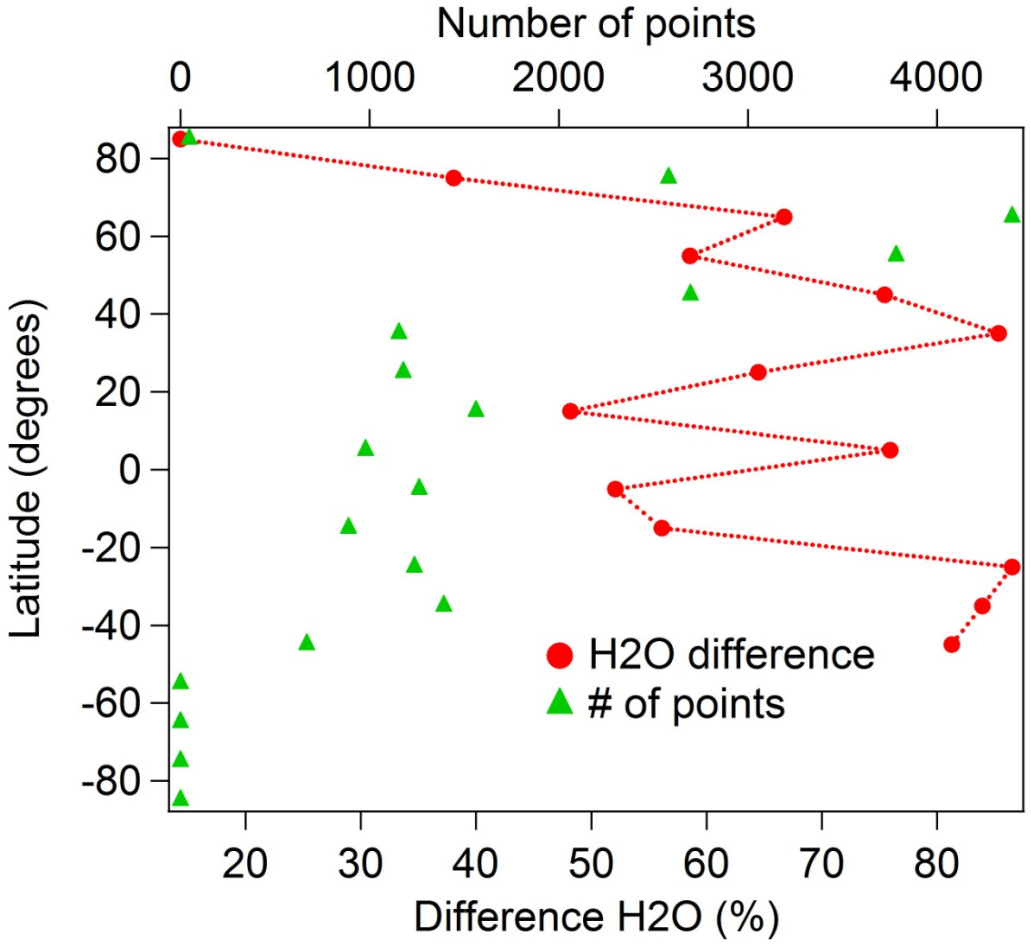
dH2O =
50 ~ 75 %

Algorithm 1 - Land fraction



Higher land fraction, larger dH2O (%)

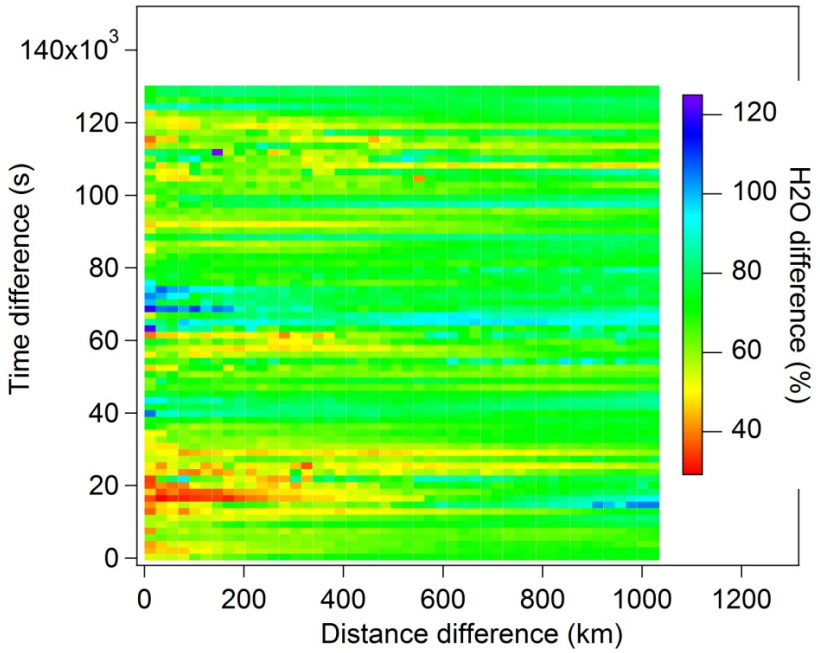
Algorithm 1 - Latitude



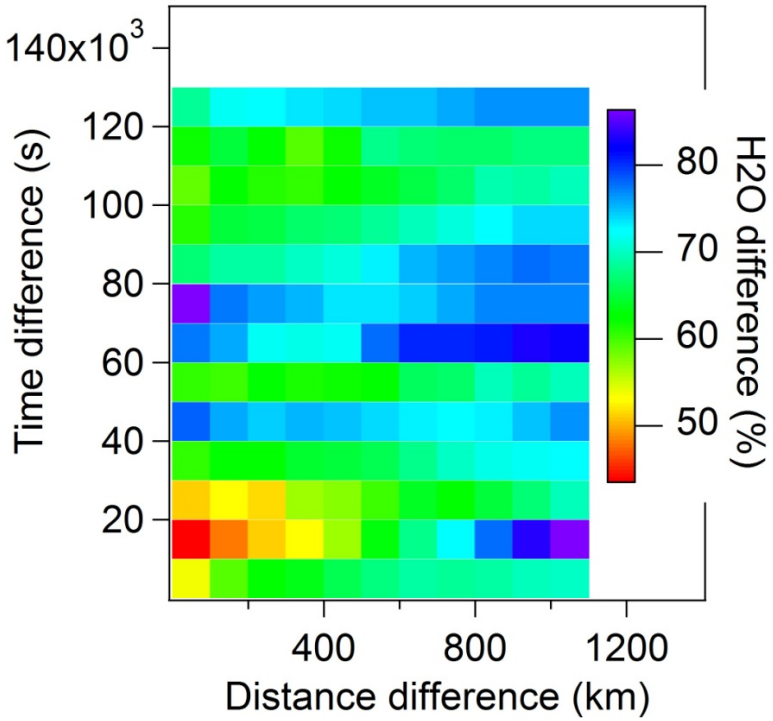
Similar dH2O (%) in NH and SH hemispheres.

Influences of *d*Time and *d*Distance - Grids of H2O difference

Bin by 22.5km * 1800 s



Bin by 100km * 1e4 s



Temperature comparison

1. Data: reference aircraft temperature (ATX)

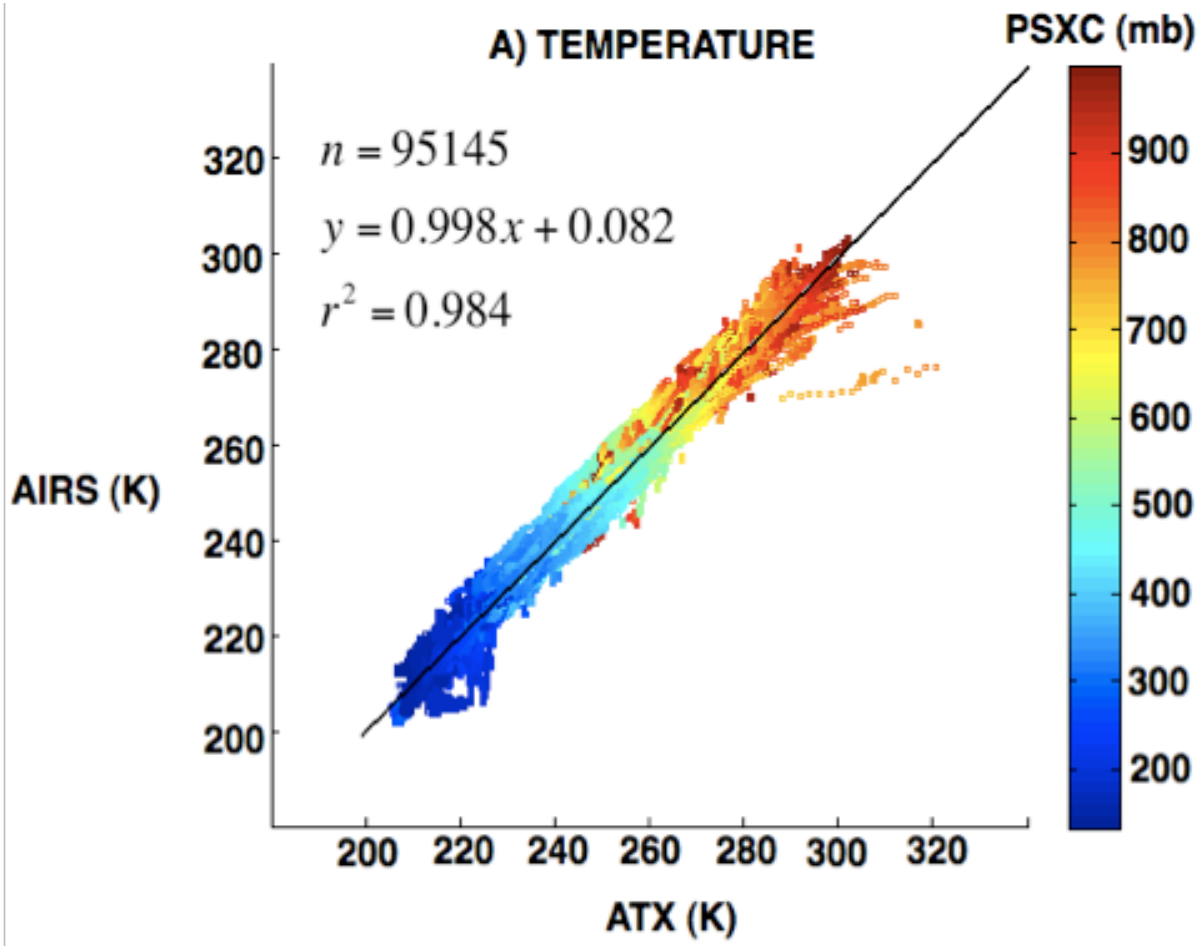
2. T Quality Control

Delete:

P>PGood

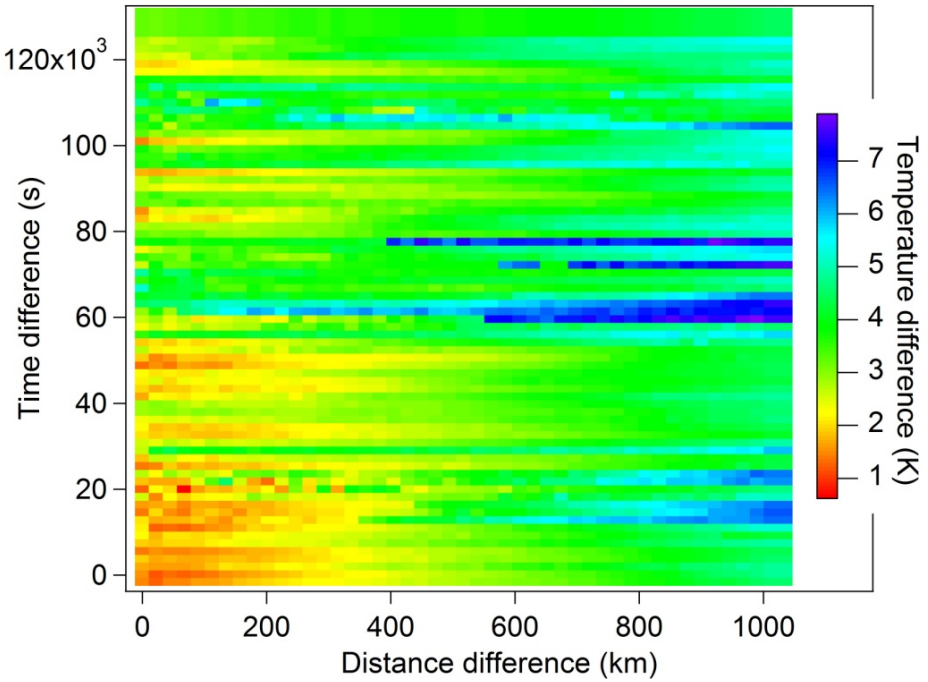
(Susskind,2007)

3. Algorithm 1

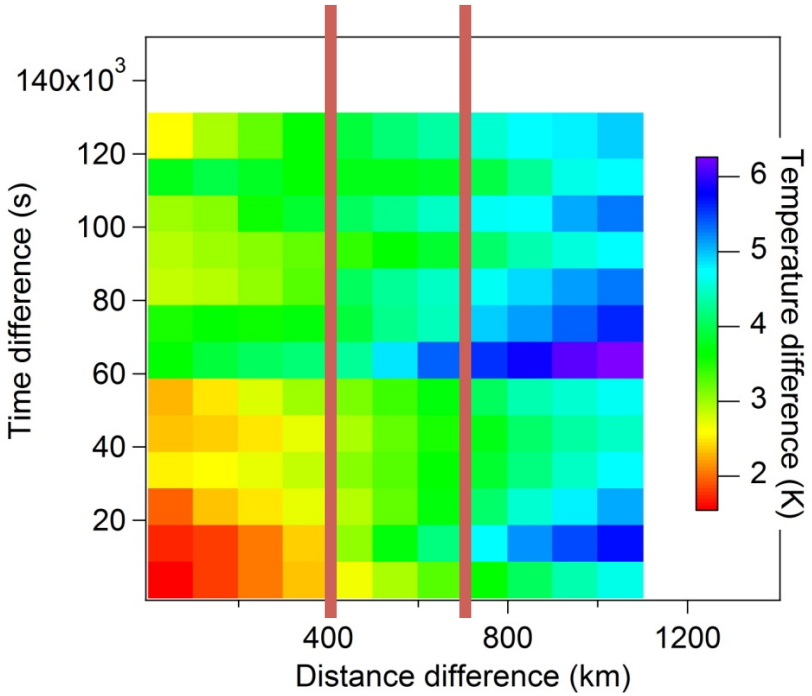


Grids of temperature difference

Bin by 22.5km * 1800 s



Bin by 100km * 1e4 s



Conclusion

1. Choice of criteria influences the comparison

- Average window criteria better than 1 point selection

2. Pressure, Land fraction, latitude dependence

- Pressure: 50~ 75% (should improve if use average window)
- Land fraction: generally higher land fraction, larger dH2O (%)
- Latitude: similar dH2O between 0~60 N and 0~60S

3. Temporal and spatial influence on H2O comparison

H2O has both strong dependence on space and time

Temperature has stronger dependence on distance than time

Future work

Compare more algorithms;

Define "optimal" algorithms for H2O and temperature, respectively

Thank you!

Questions?