2021 Open Data Workshop
(December 7th)

DCOTSS
NASA Earth Venture Suborbital 3
Dynamics and Chemistry of the Summer Stratosphere

Harvard Water Vapor
(Harvard Herriot Hygrometer & Lyman-α)

HWV: HHH & LyA

PI: Jessica B. Smith
(jsmith@huarp.harvard.edu)

Data Collection: HWV

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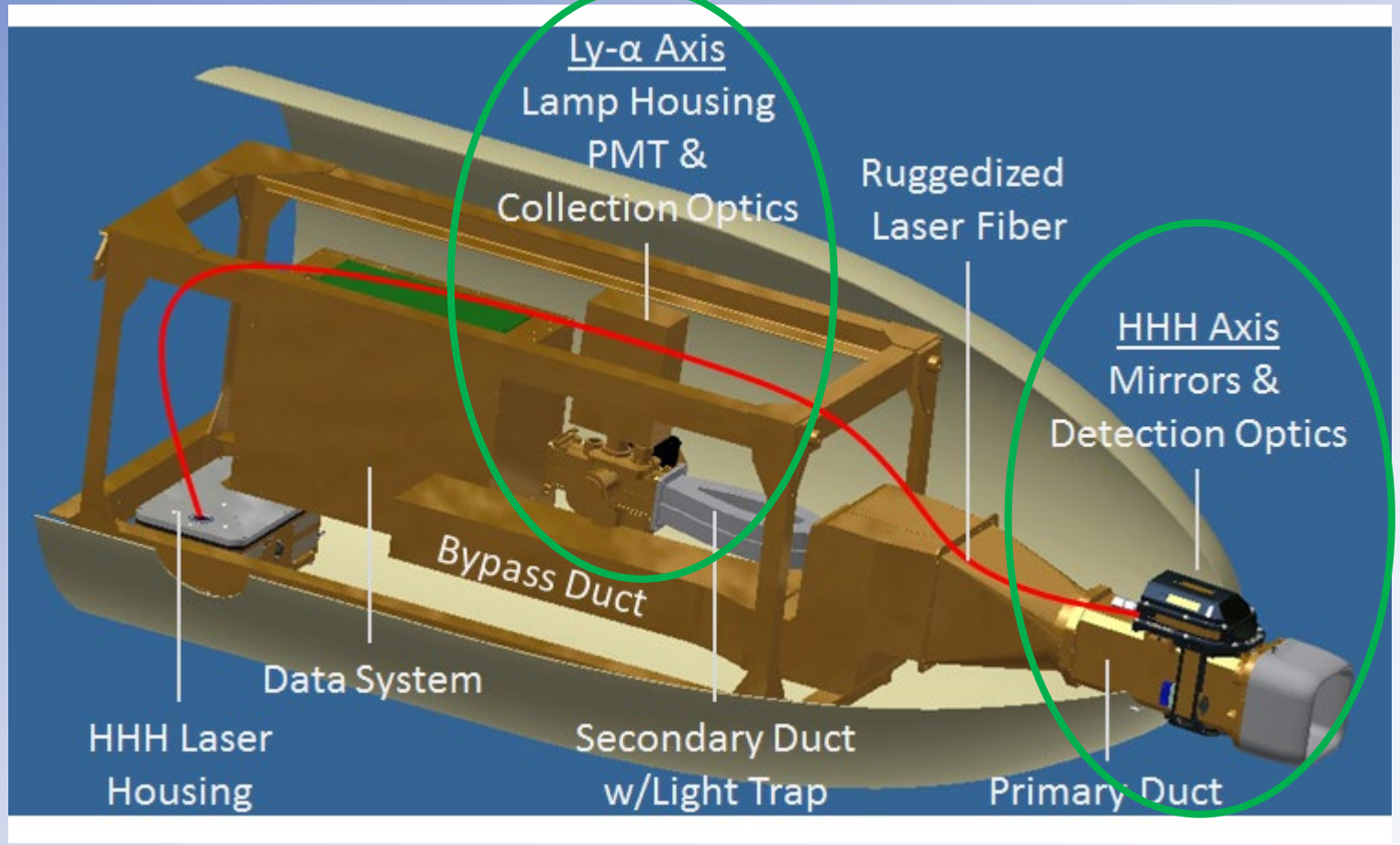
- In situ measurement of ambient water vapor
- Harvard Herriot Hygrometer (HHH) & Lyman-α (LyA)
- Two independent measurements in a shared



Data Collection: HWV

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- In situ measurement of water vapor
- Installed in Right Wing Pod of ER-2
- Fast flow through duct yields a fast response measurement (1 & 10 Hz)

Data Collection: Lyman-α

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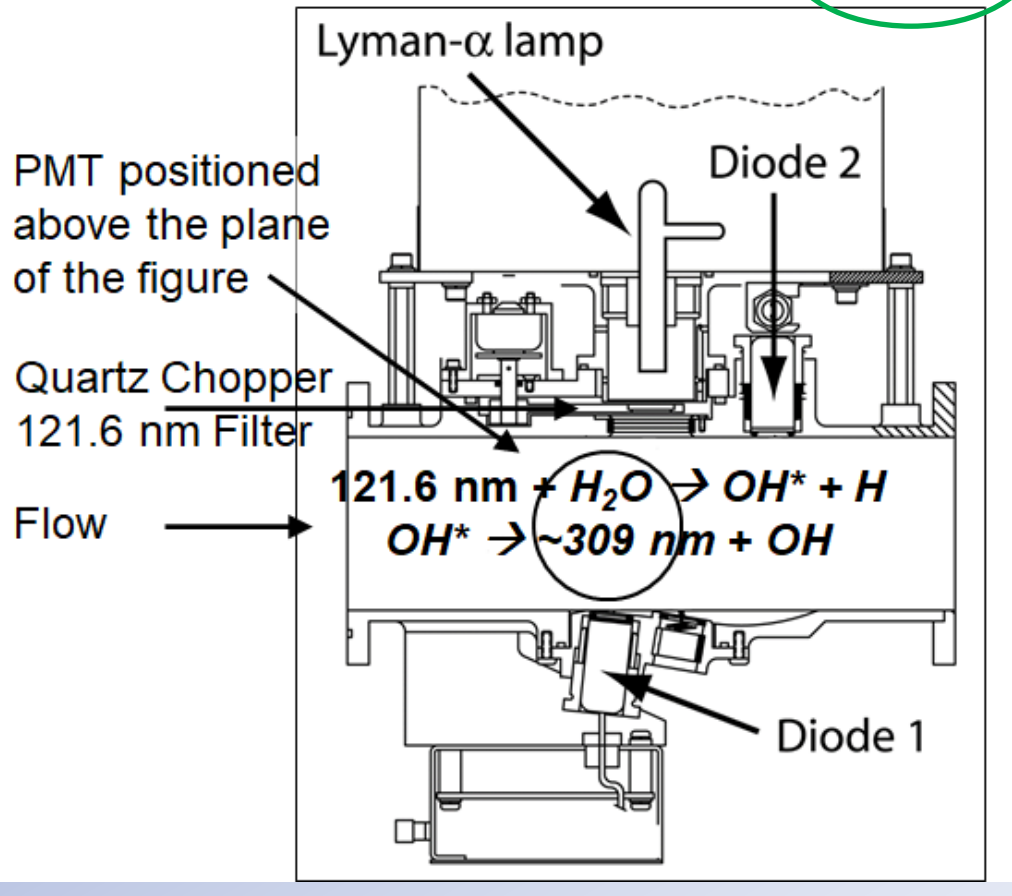
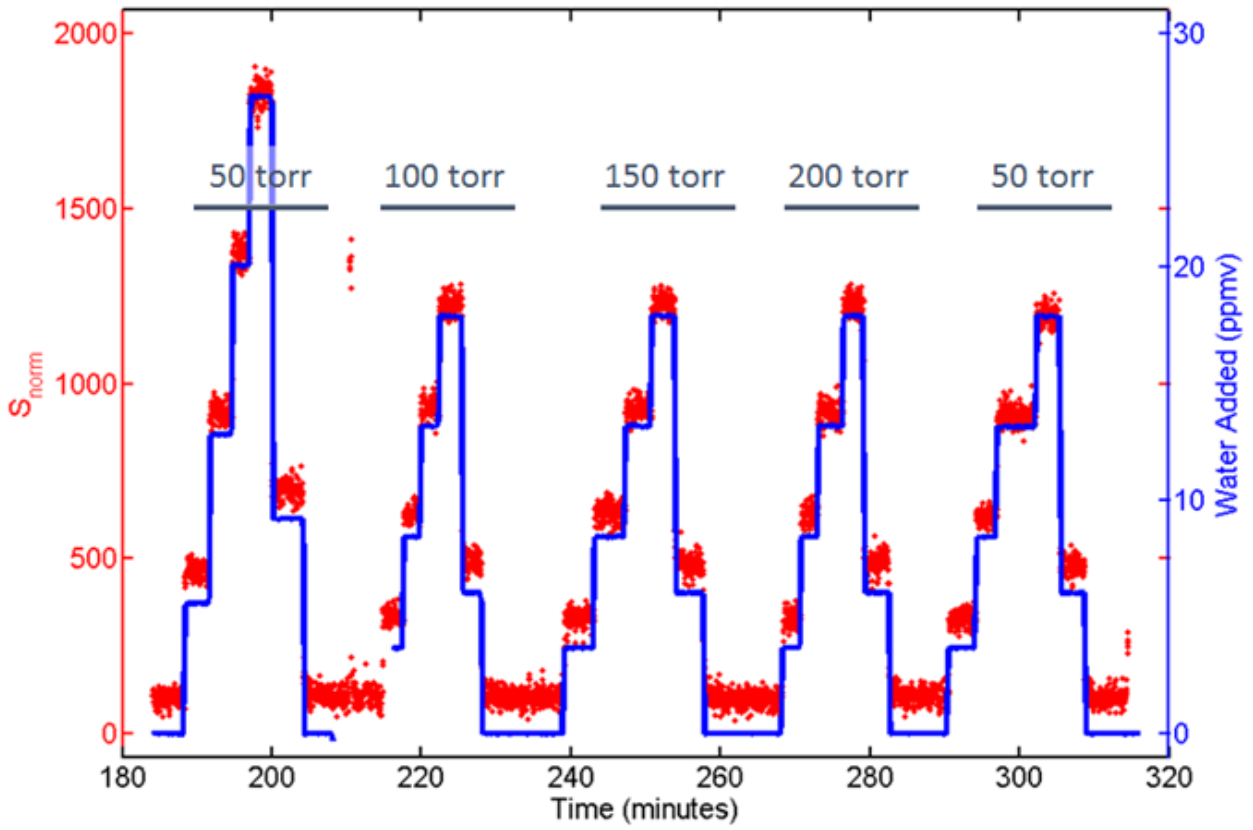
Lyman-α Instrument (LyA)

* Normalized Counts = $S_{norm} = C\,[H_2O]$; w/ $C = fn(P)$ *

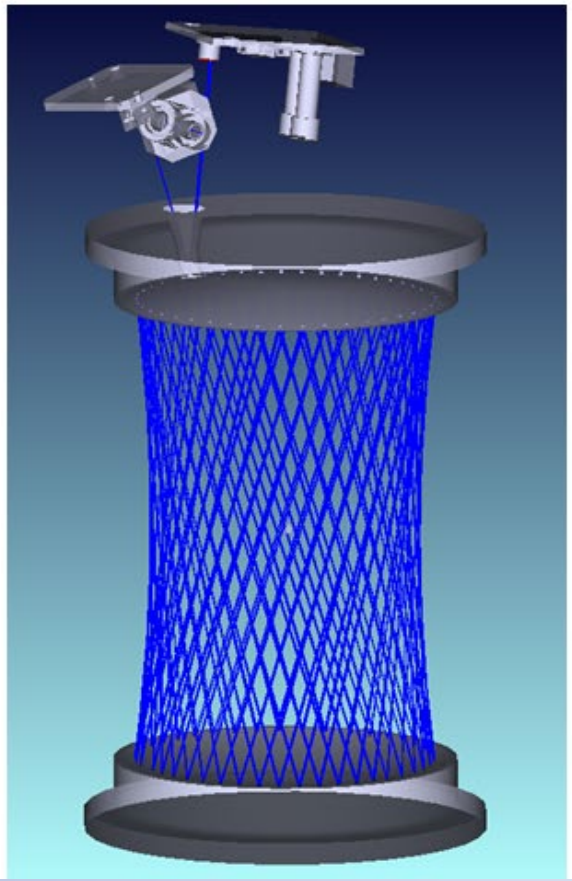


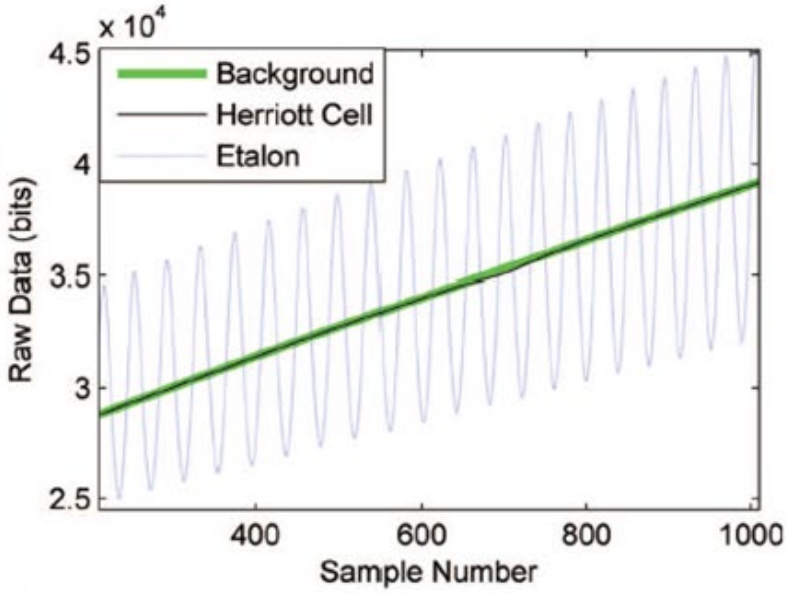


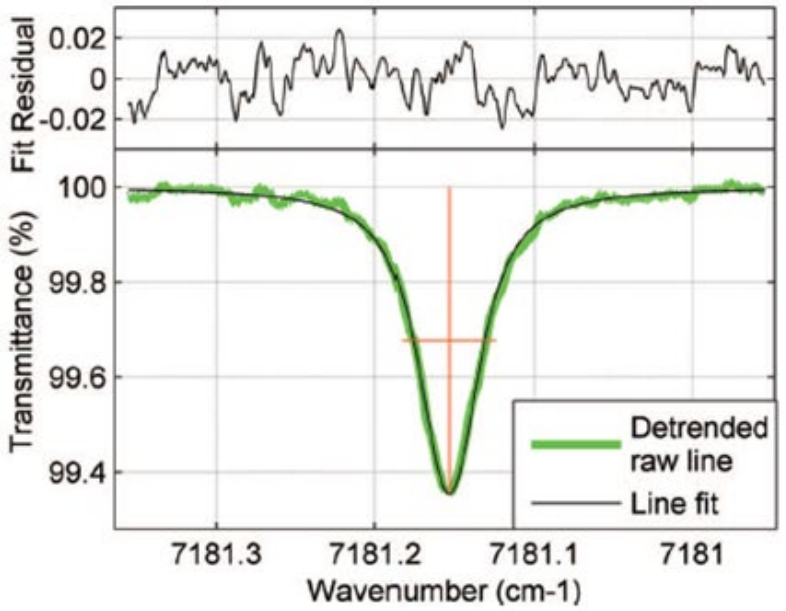
Data Collection: HHH

Harvard Herriott Hygrometer (HHH)

* Direct Absorption Technique: $-\ln(I/I_0) = [H_2O]\cdot\sigma(\nu)\cdot\ell$ *







Data Collection: References

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- Weinstock, E. M., et al., (1994), "New fast response photofragment fluorescence hygrometer for use on the NASA ER-2 and the Perseus remotely piloted aircraft," *Rev. Sci. Inst*. 65, 3544–54.

- Hintsa, E. J., et al., (1999), On the accuracy of in situ water vapor measurements in the troposphere and lower stratosphere with the Harvard Lyman-α hygrometer, *J. Geophys. Res.,* 104, 8183-8189.

- Sargent, M. R. et al., (2013), A new direct absorption tunable diode laser spectrometer for high precision measurement of water vapor in the upper troposphere and lower stratosphere, *Rev. of Sci. Inst.*, 84, 074102.

File Structure & Content

DCOTSS
NASA Earth Venture Suborbital 3
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- Time series of ambient water vapor mixing ratio (ppmv) and uncertainty (ppmv) for both axes: HHH and LyA
- Data are archived using the ICARTT file format
- Range: mixing ratios <1000 ppmv, and/or pressures <400 hPa
- Primary output at 1 Hz

- HHH data at 10 Hz available for flights from 210802 to 210823

Data Limitations & Considerations

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Generic specifications below – Look in header for detailed specs.

- 5% uncertainty established during laboratory calibration
- <±0.2 ppmv potential measurement bias
- ~0.1 ppmv (LYA), ~0.01 ppmv (HHH) precision at 1 Hz

- Recommend using HHH data for science analyses because of better precision and continuous measurement
- LyA data are used for real-time monitoring during flight

Data Limitations & Considerations

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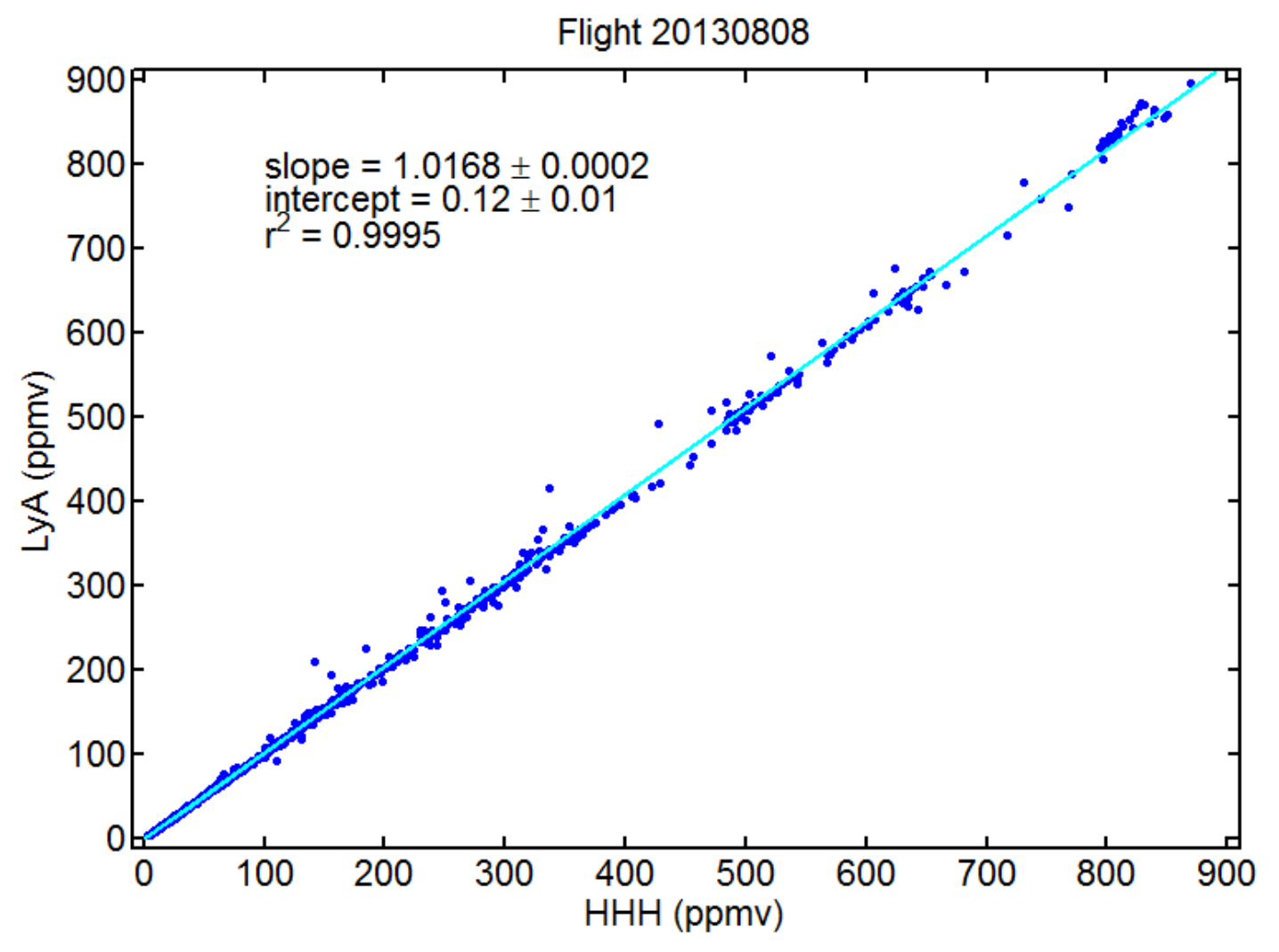
- Agreement between HHH & LyA demonstrates that laboratory accuracy is realized in flight

  (SEAC^{4}RS Mission)



Tentative Archival Timeline

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- Estimate for final data submission to archive:

  All flights by February 2022