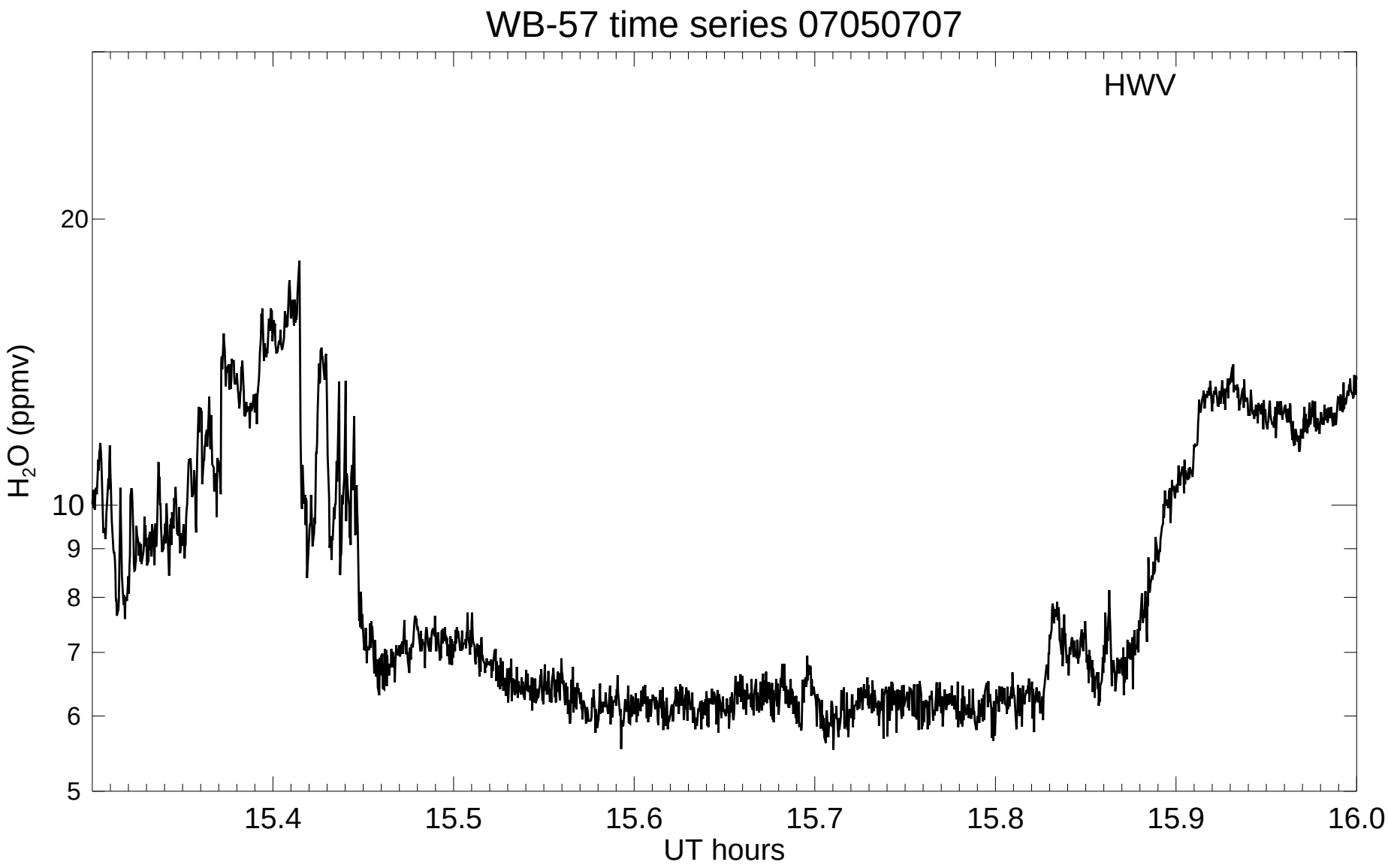
Intercomparison of WB-57 water vapor and total water measurements

Instruments:

- Harvard water vapor (HWV) – vapor
- JPL laser hygrometer (JLH) – vapor
- Integrated cavity output spectroscopy (ICOS) – vapor
- HOxotope – vapor

- Harvard total water (HTW) – total water
- ALIAS – total water

Water vapor measurements



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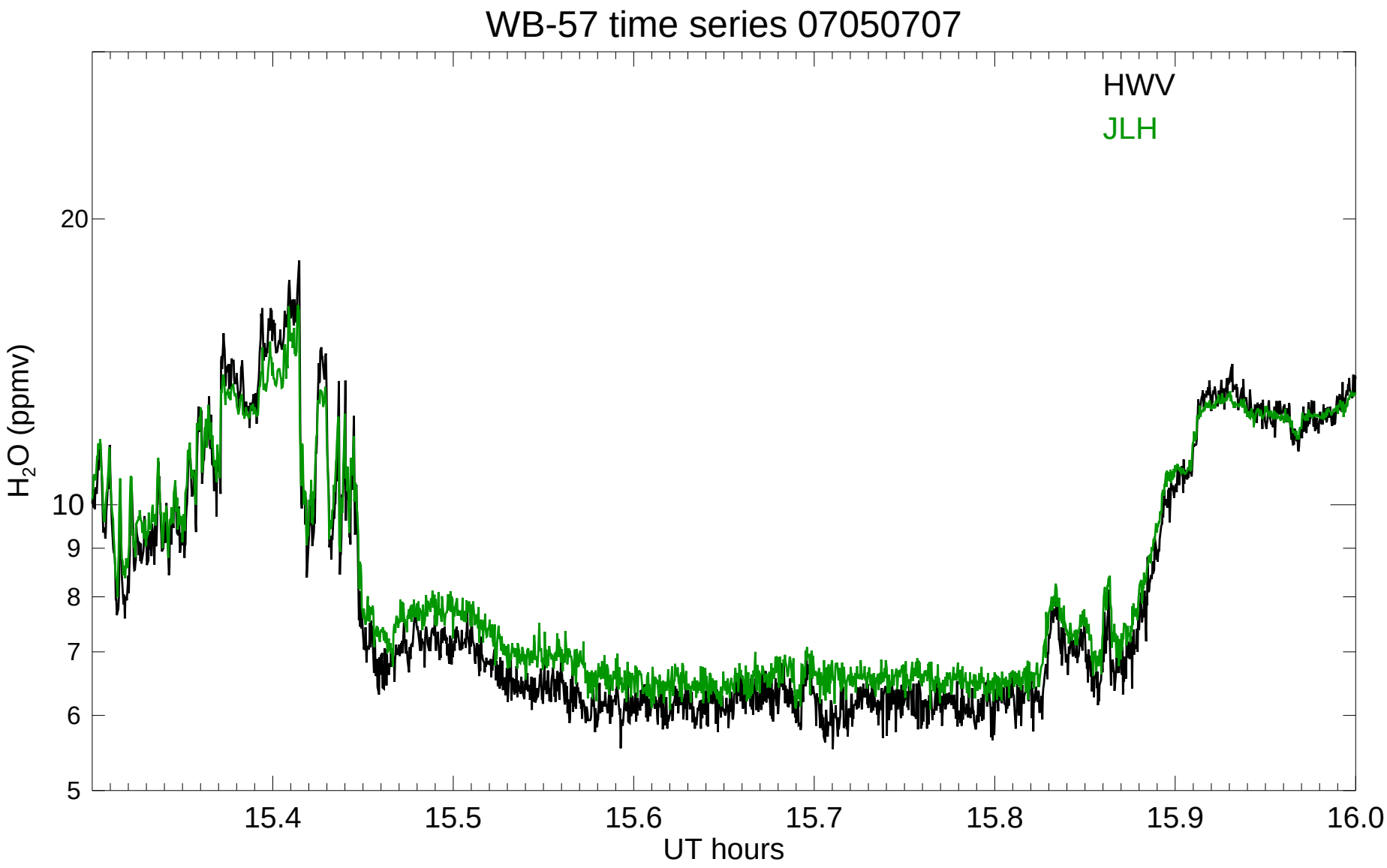

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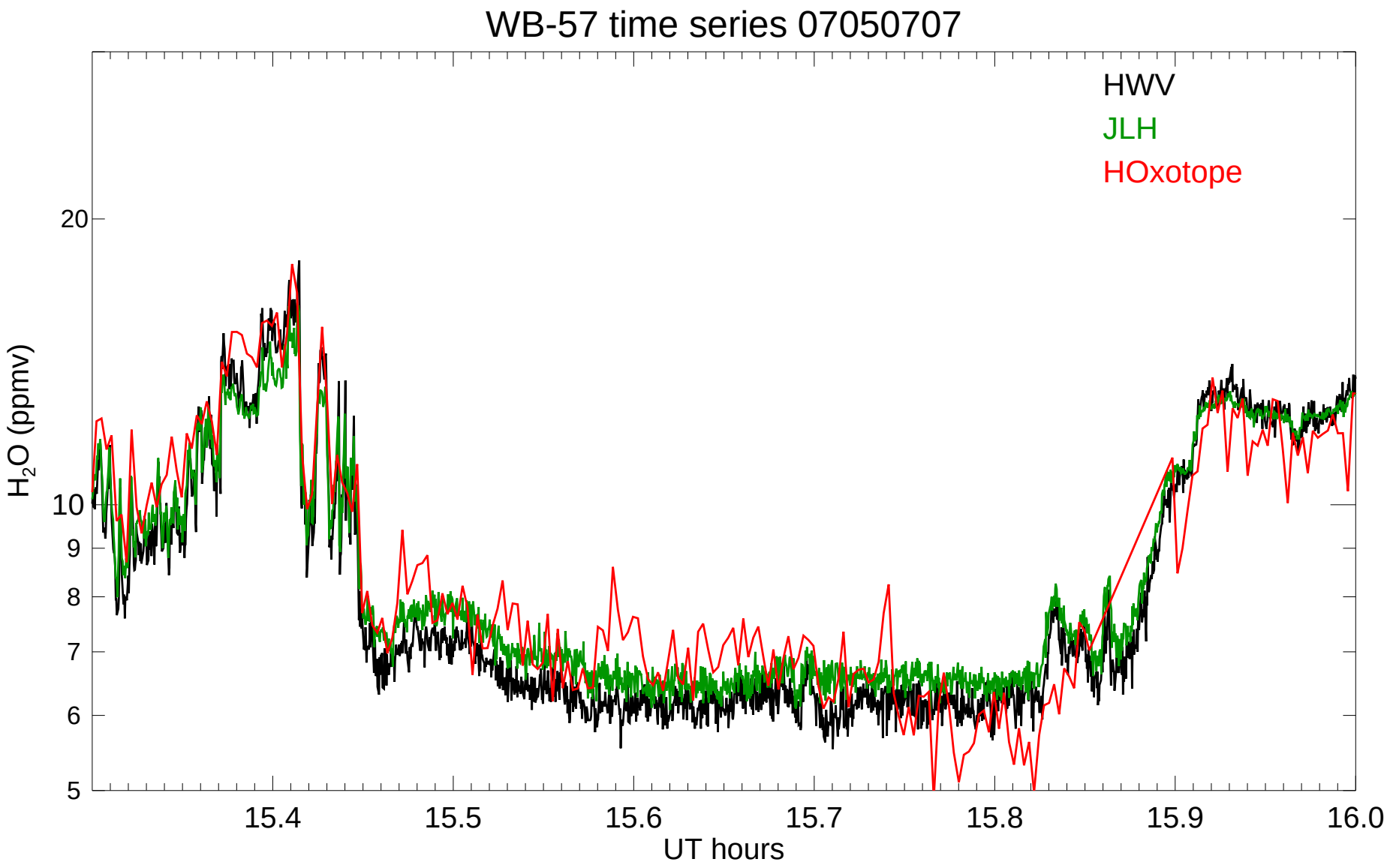

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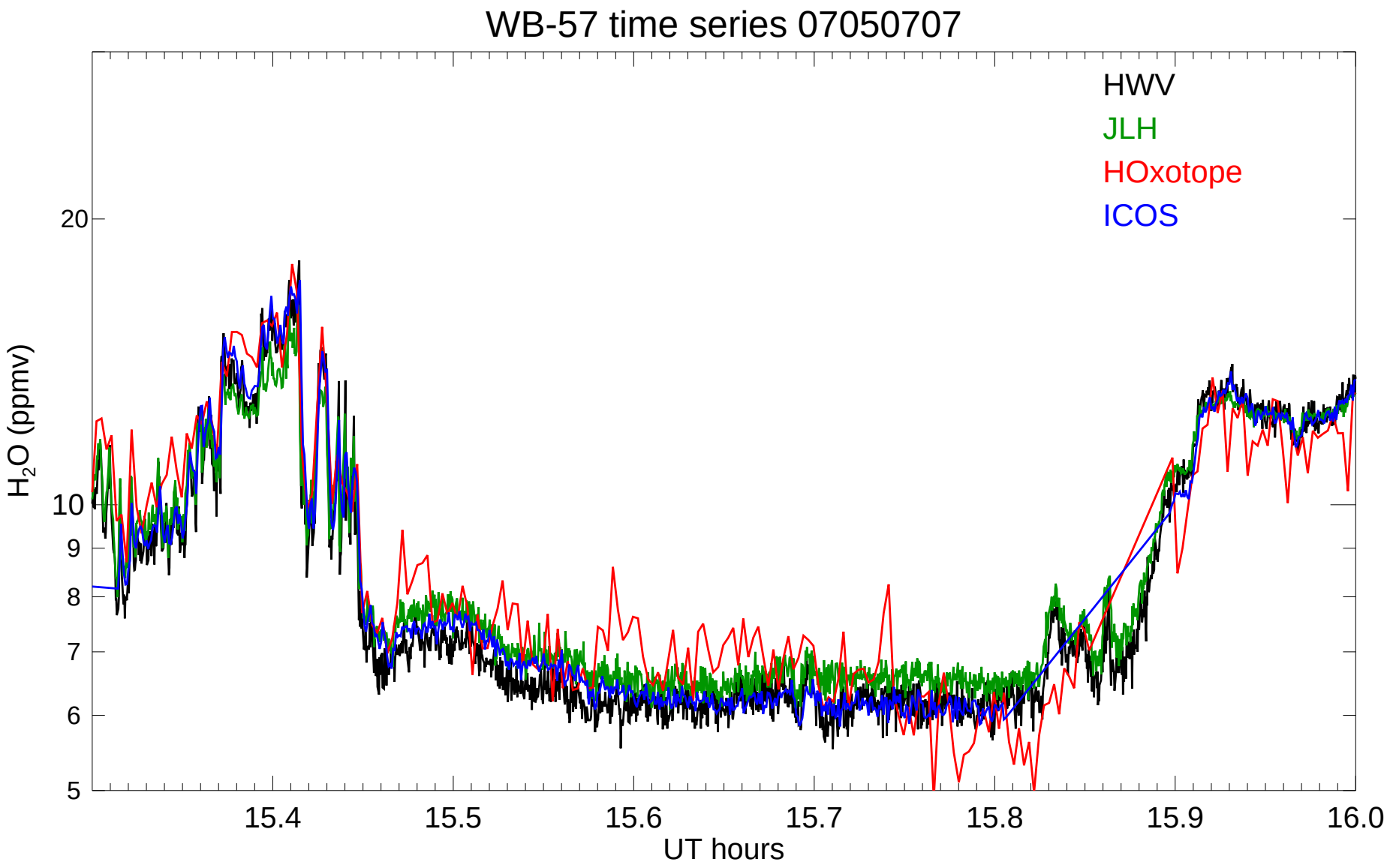

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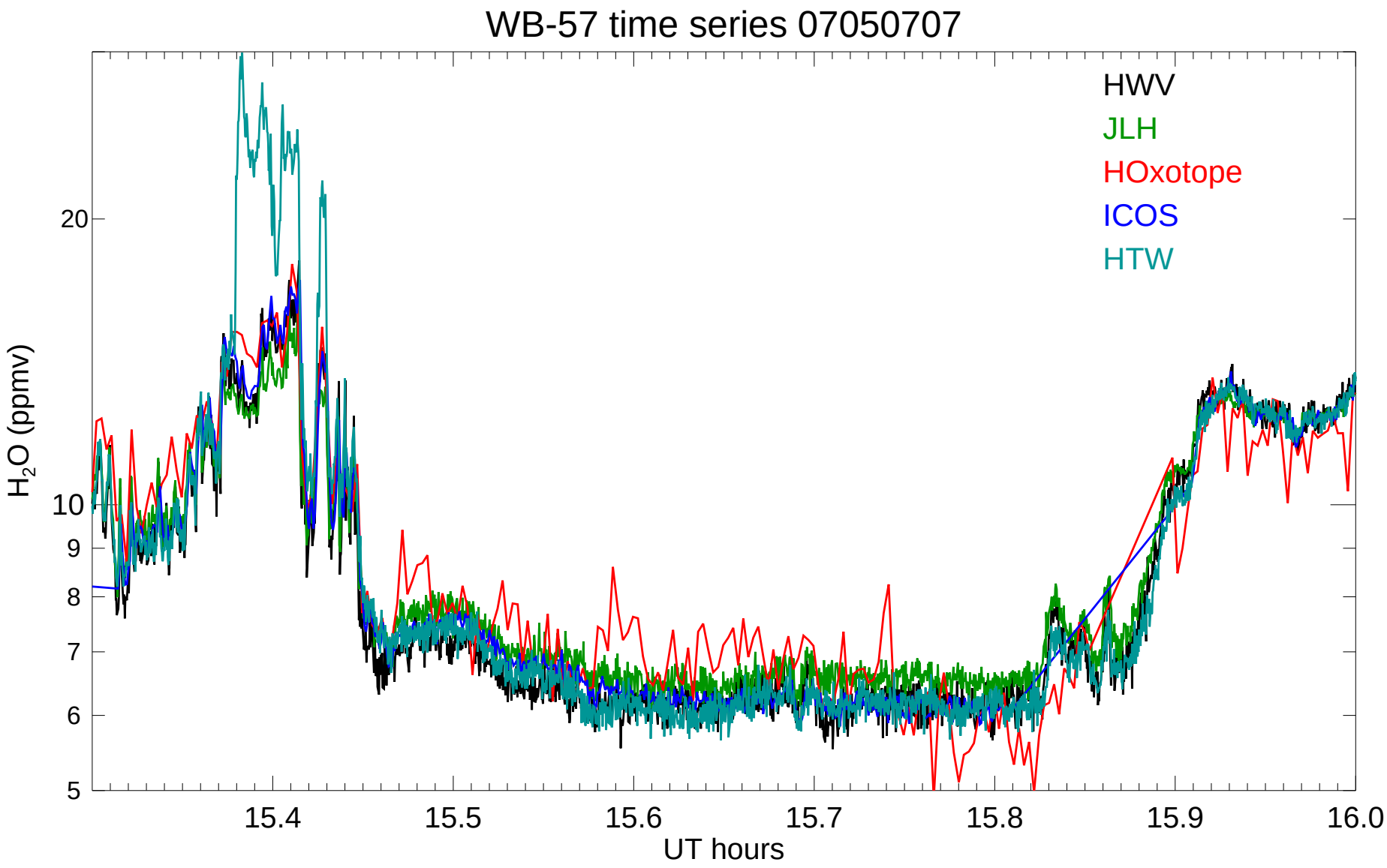

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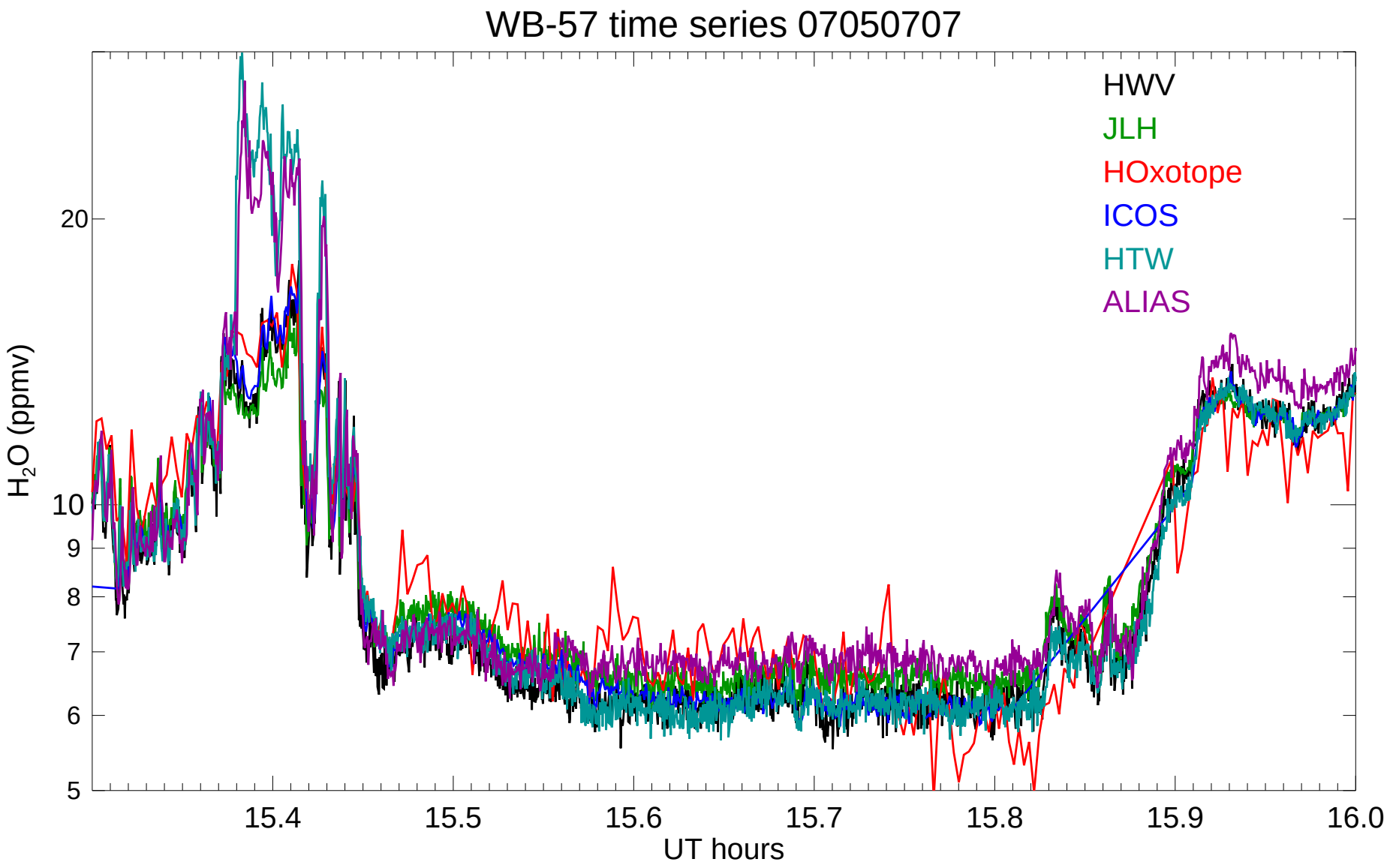

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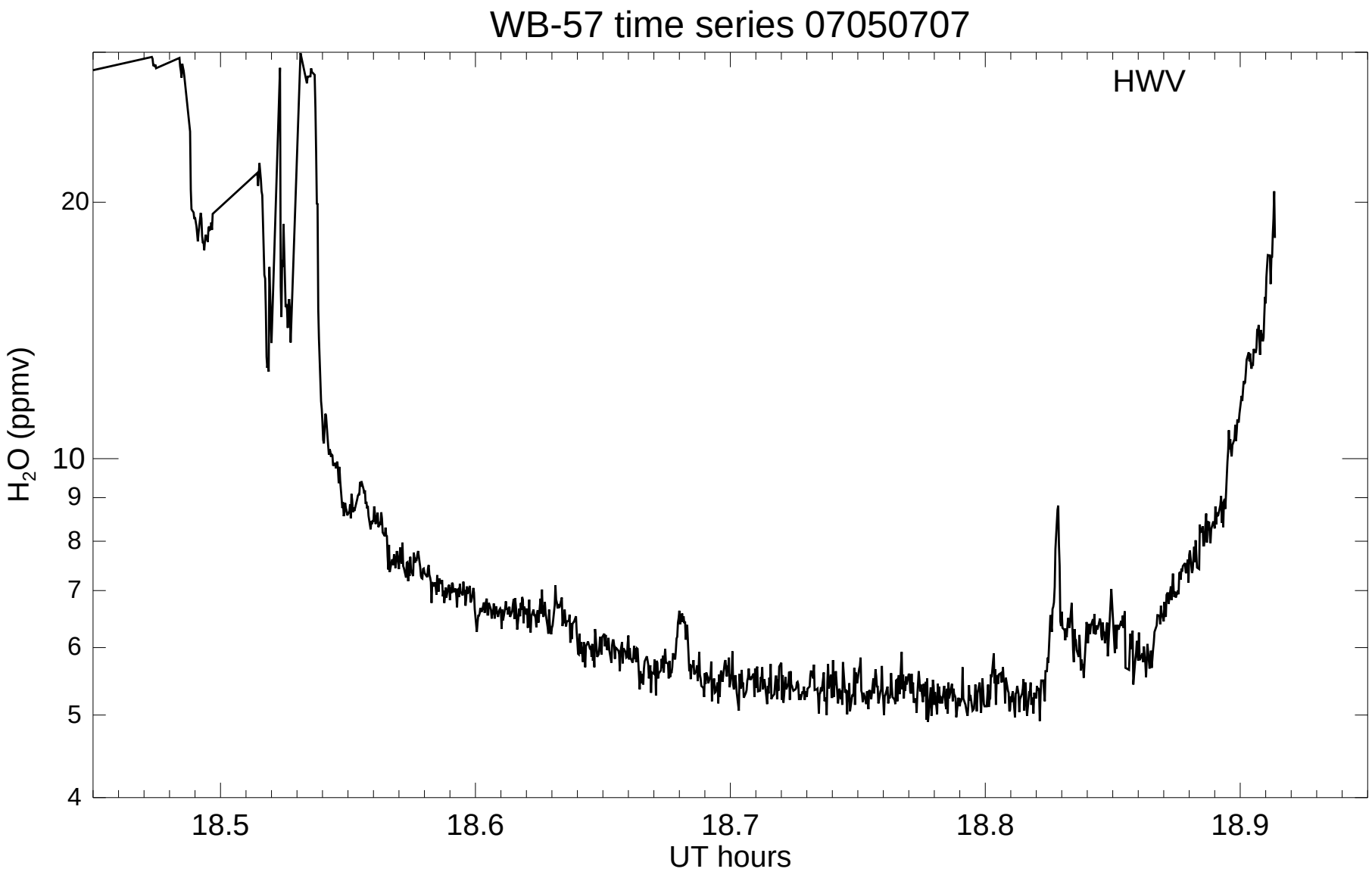

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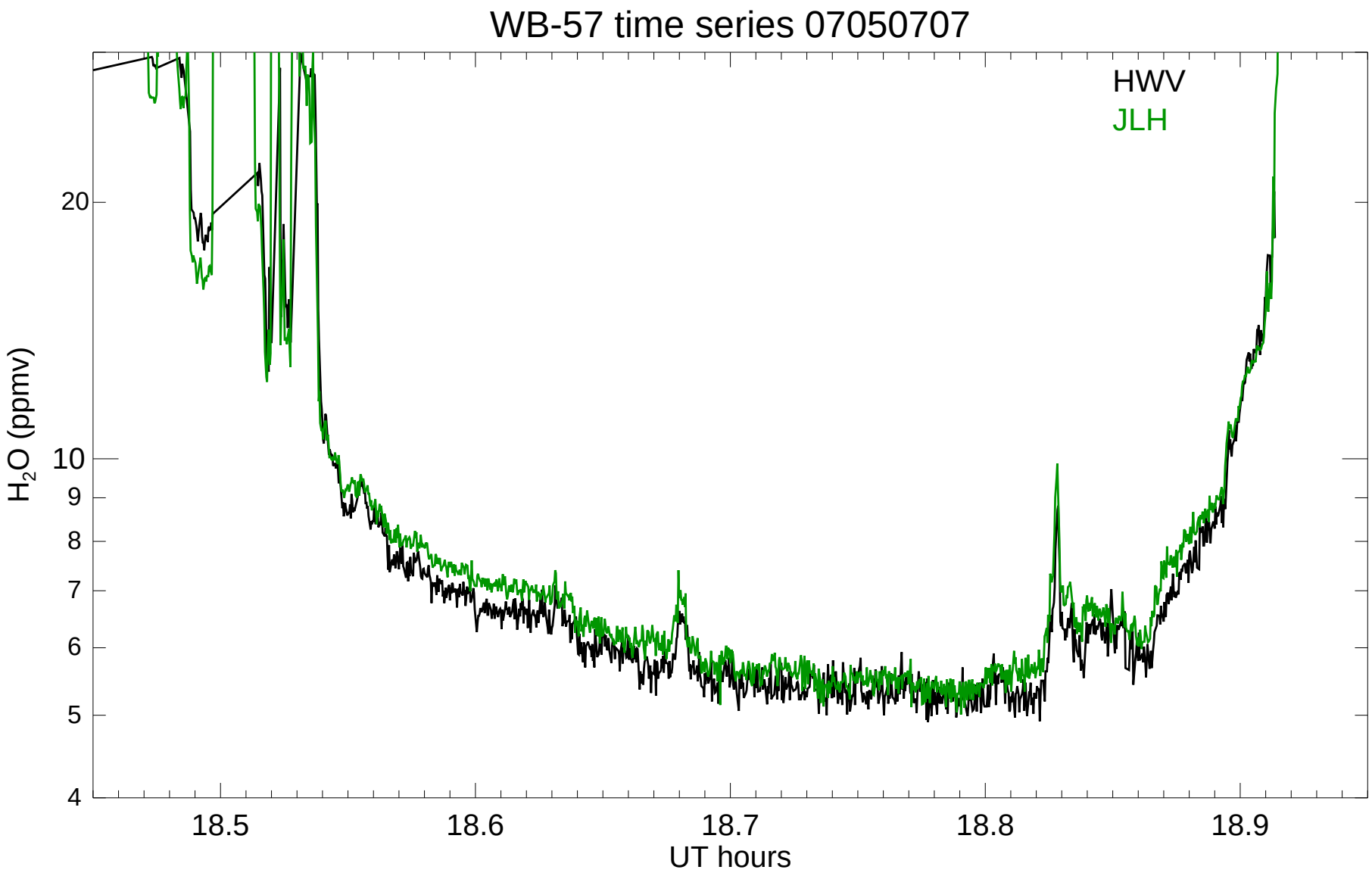

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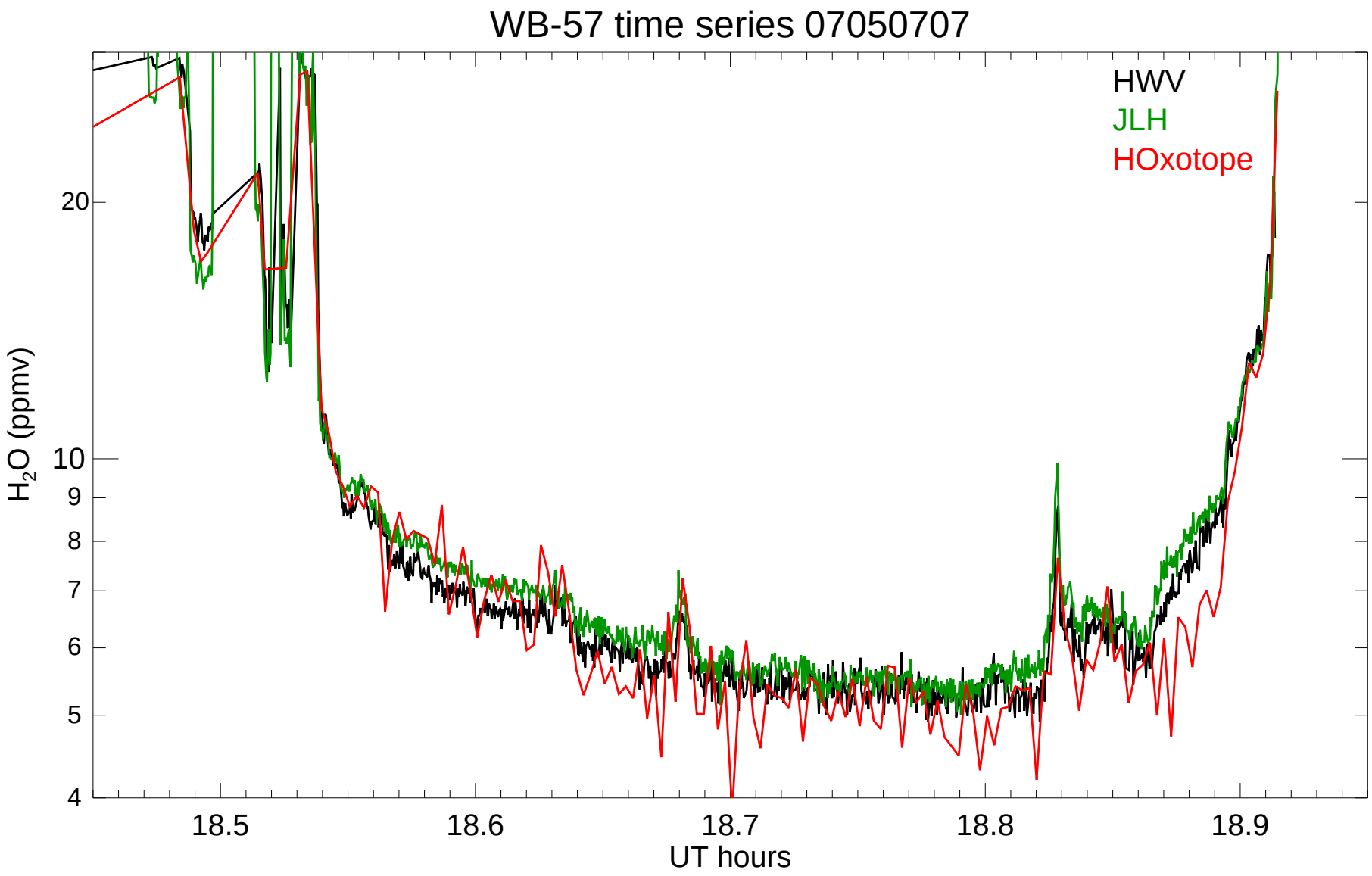

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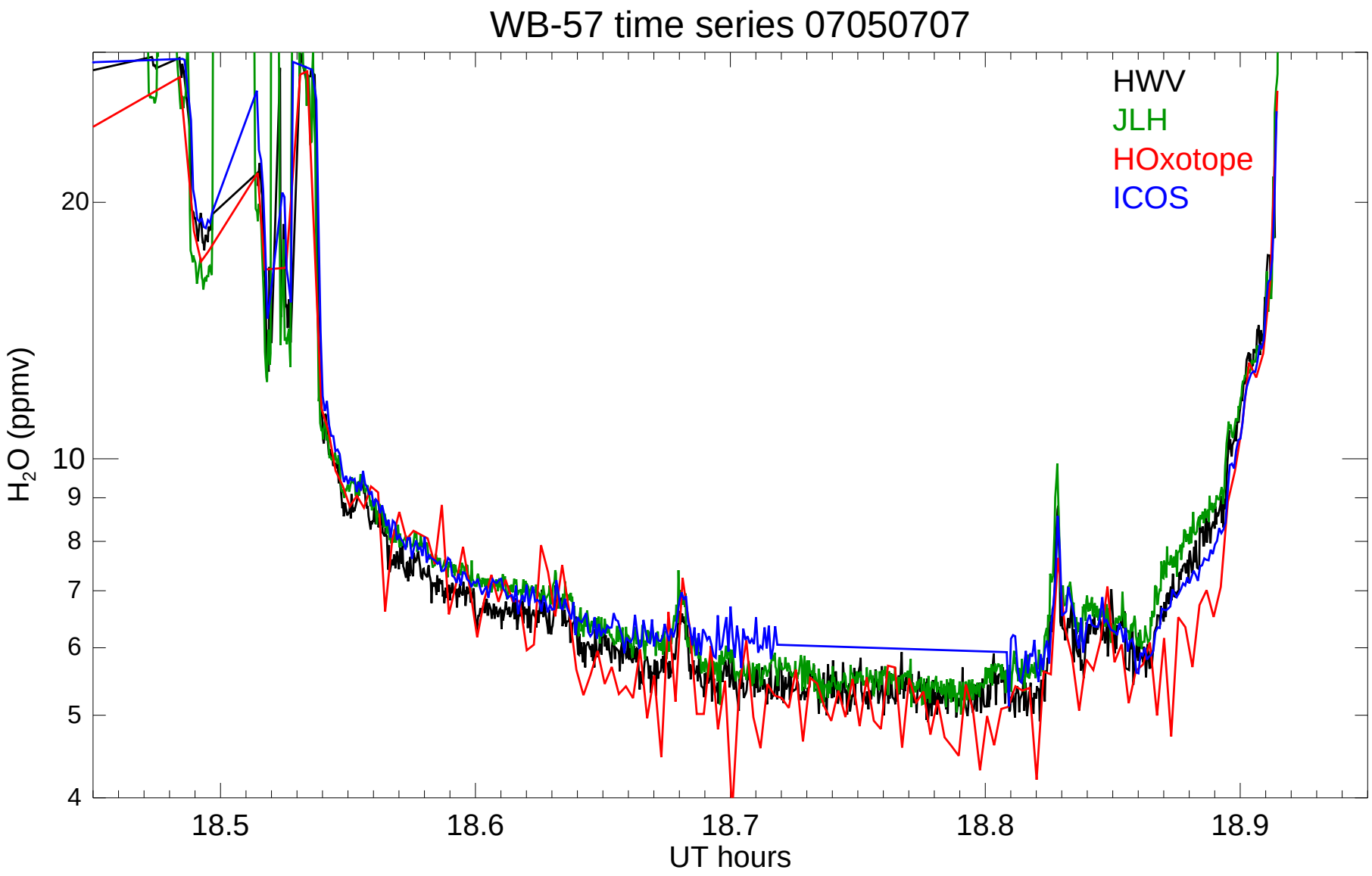

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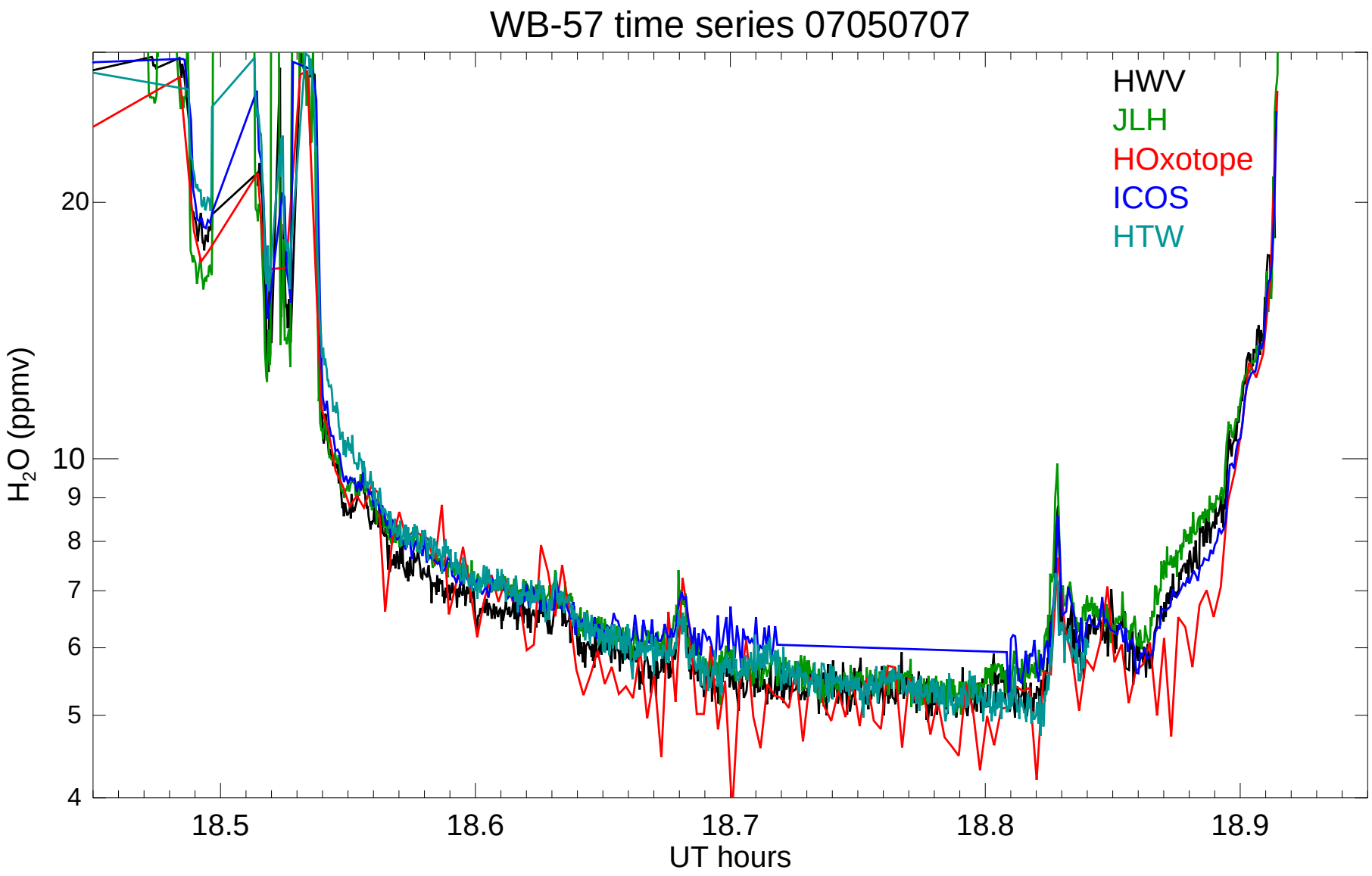

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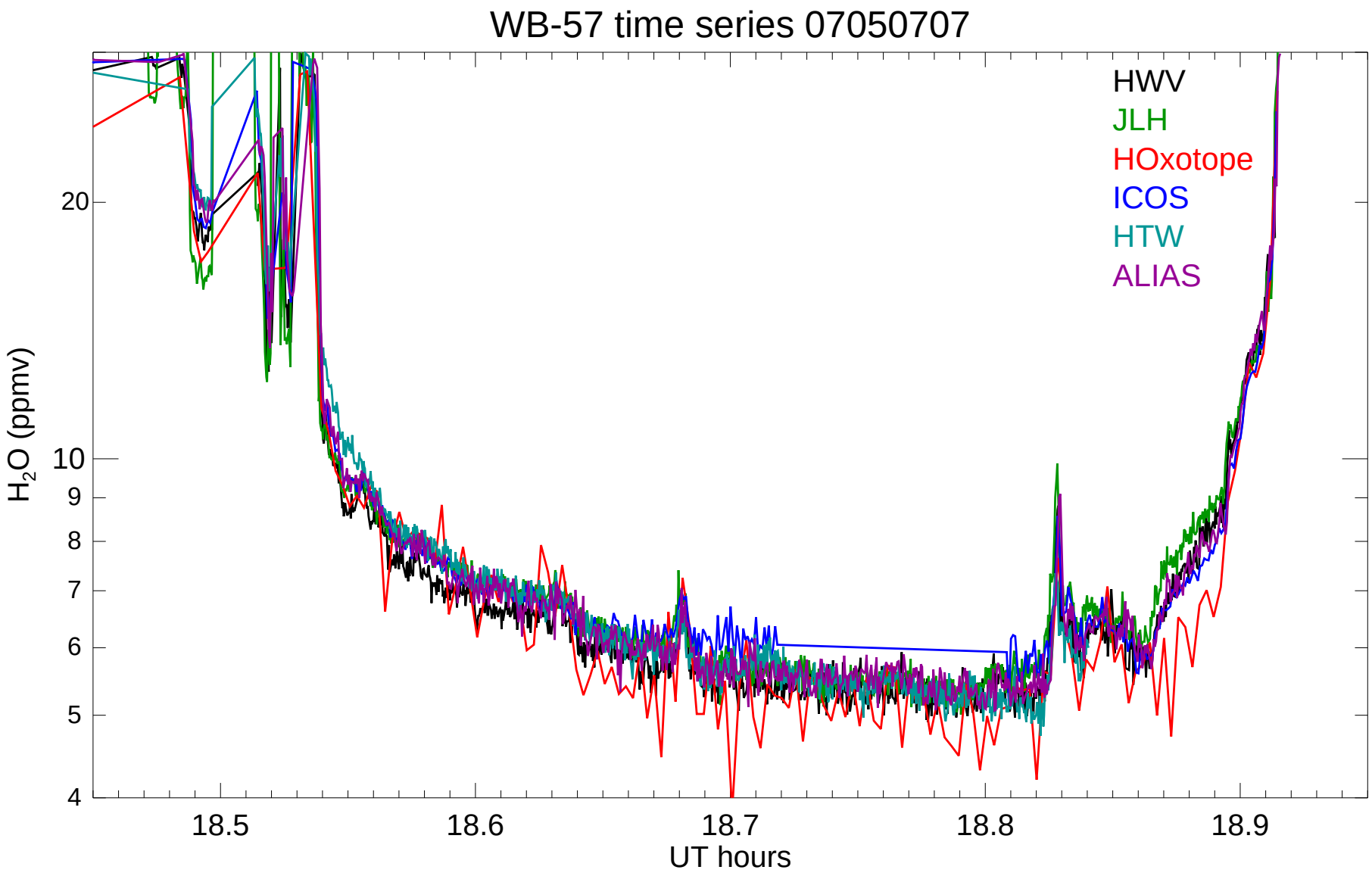
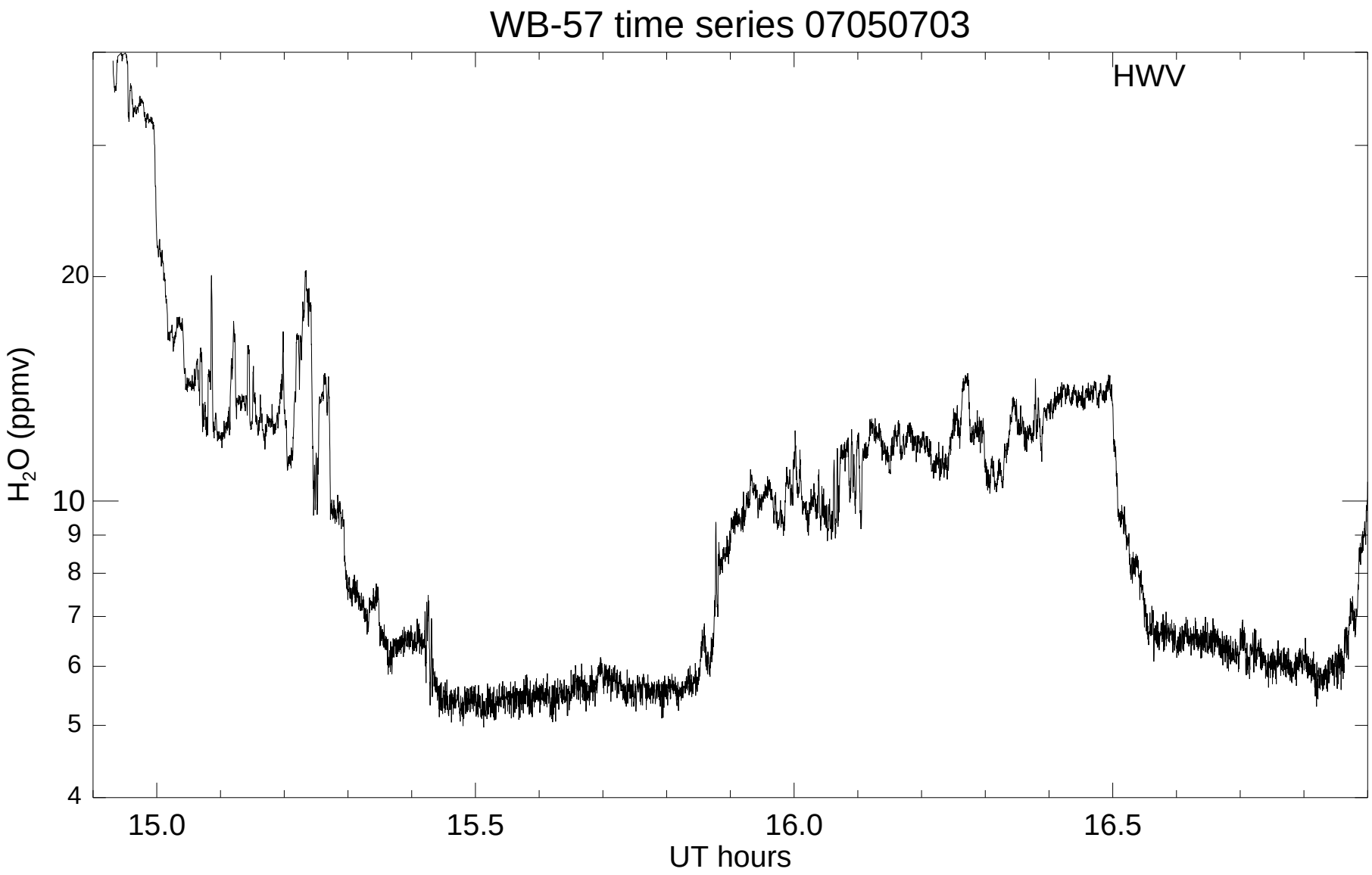


Water vapor measurements: hysteresis



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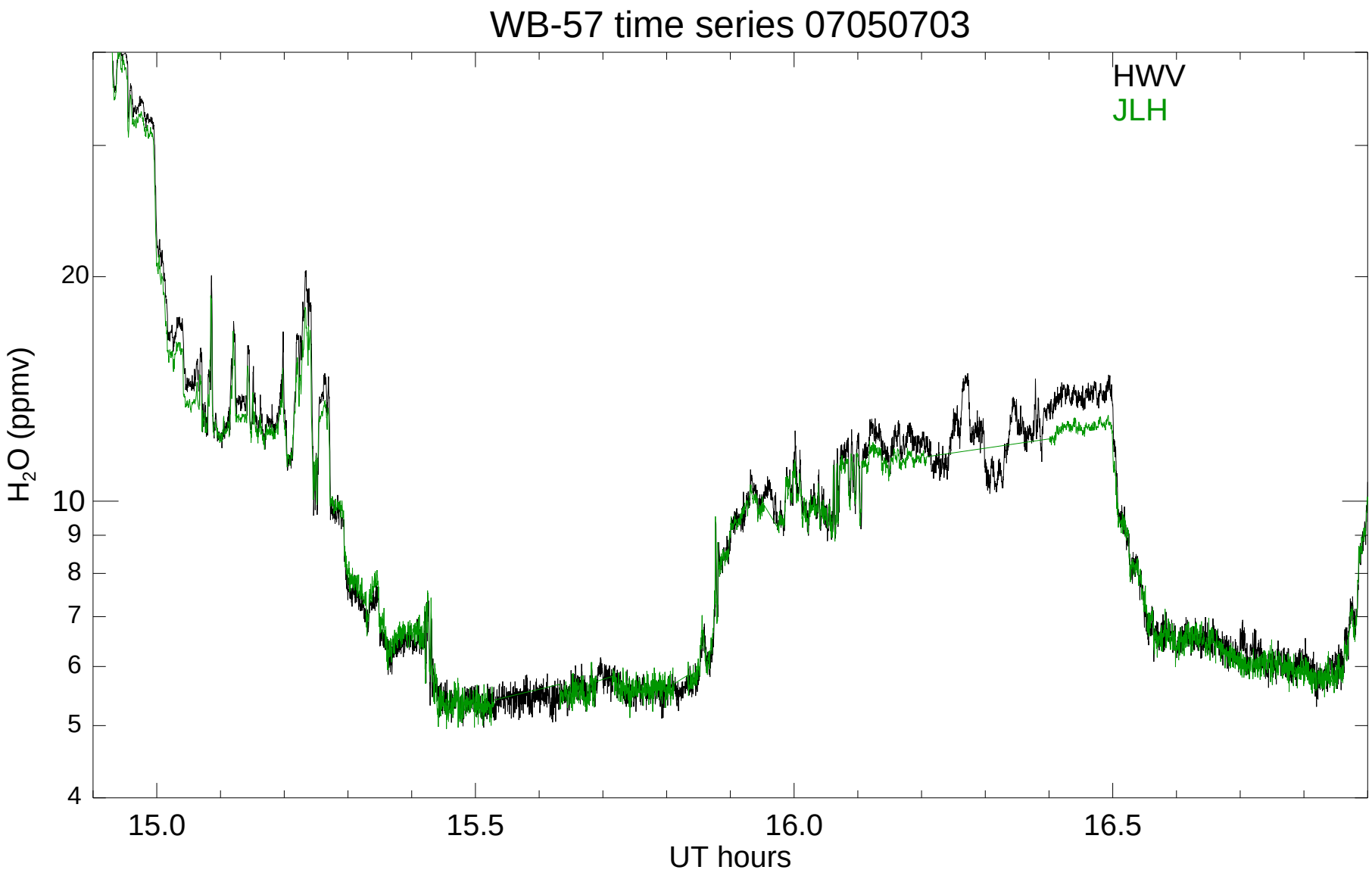

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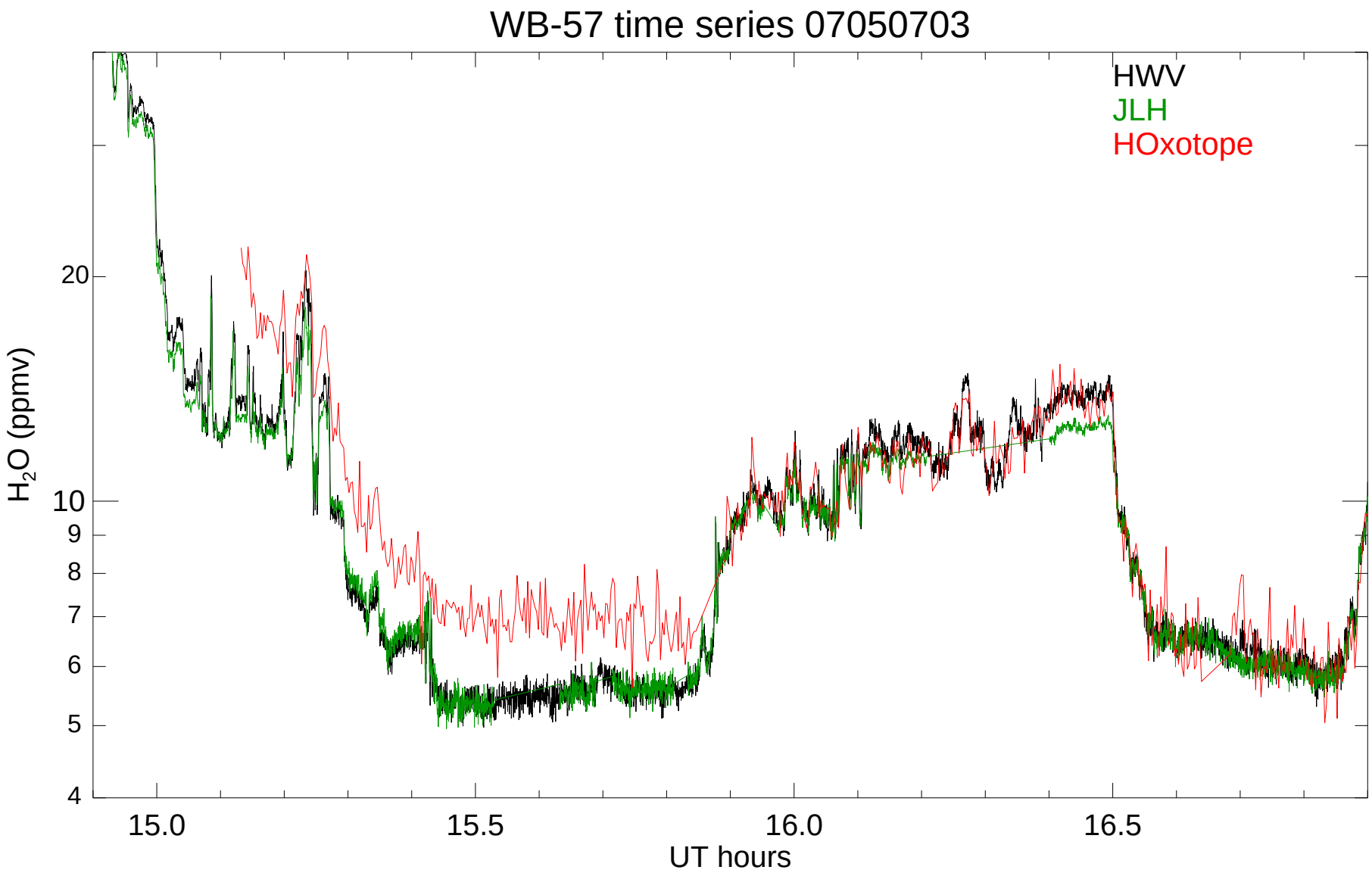

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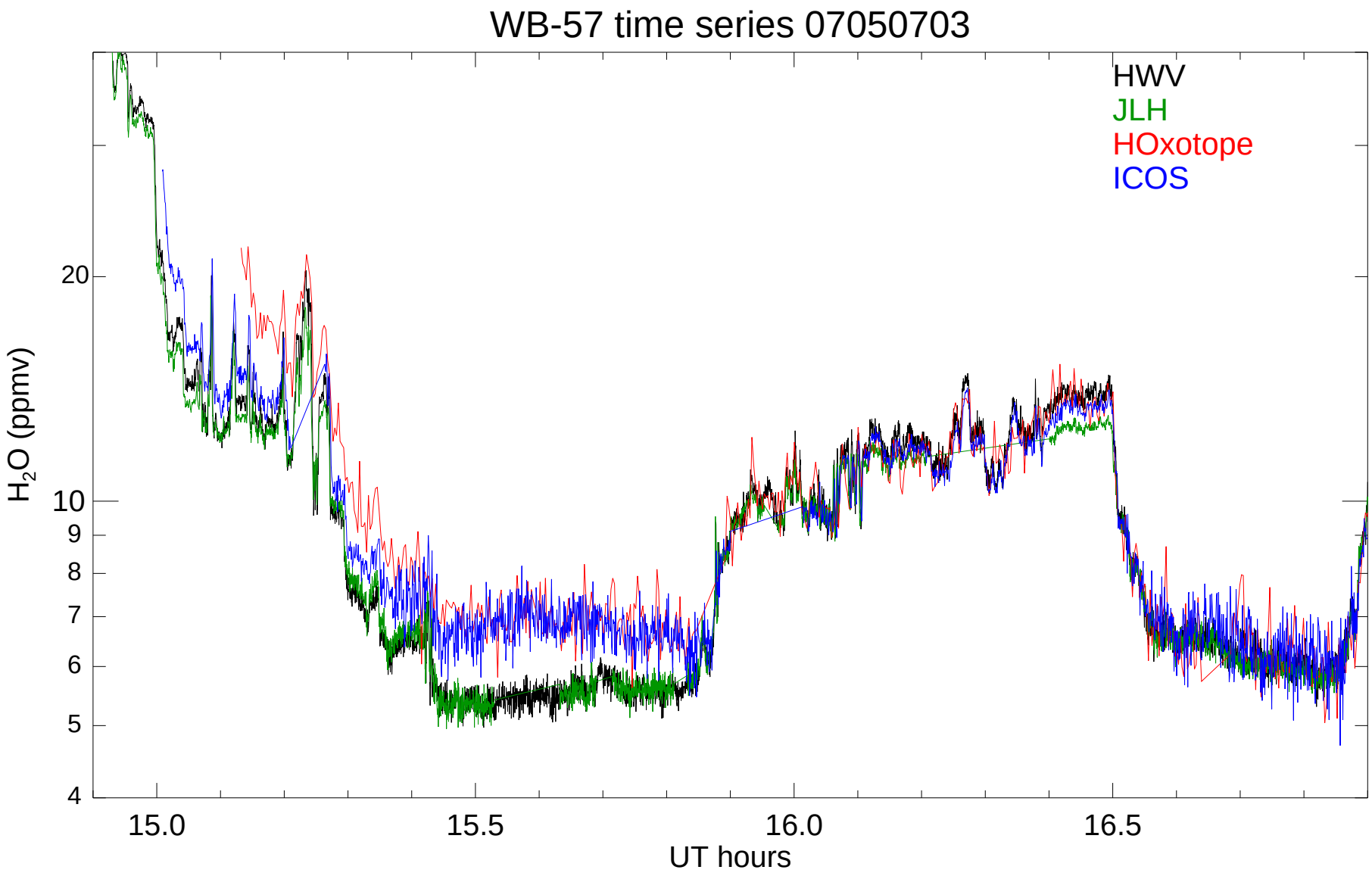

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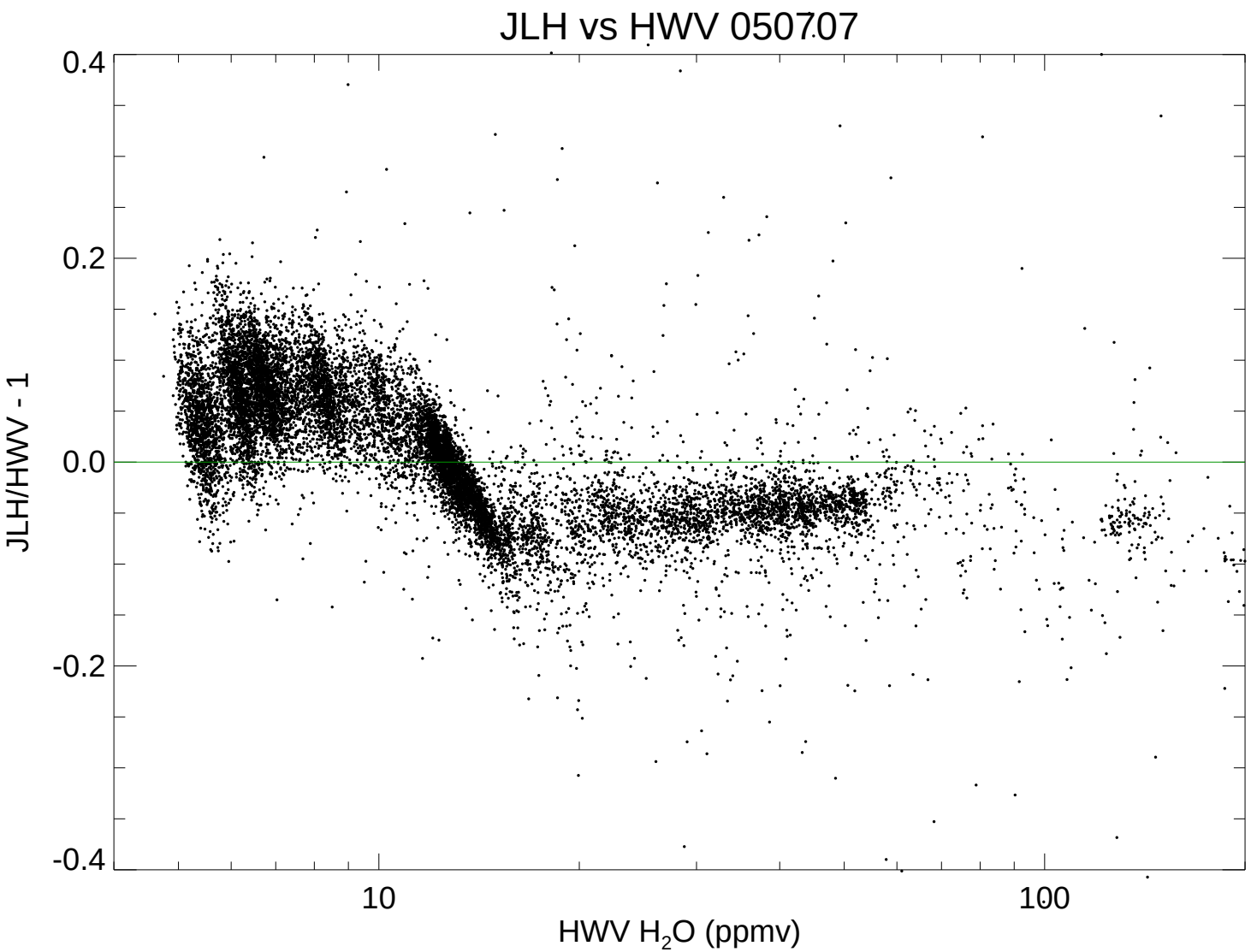

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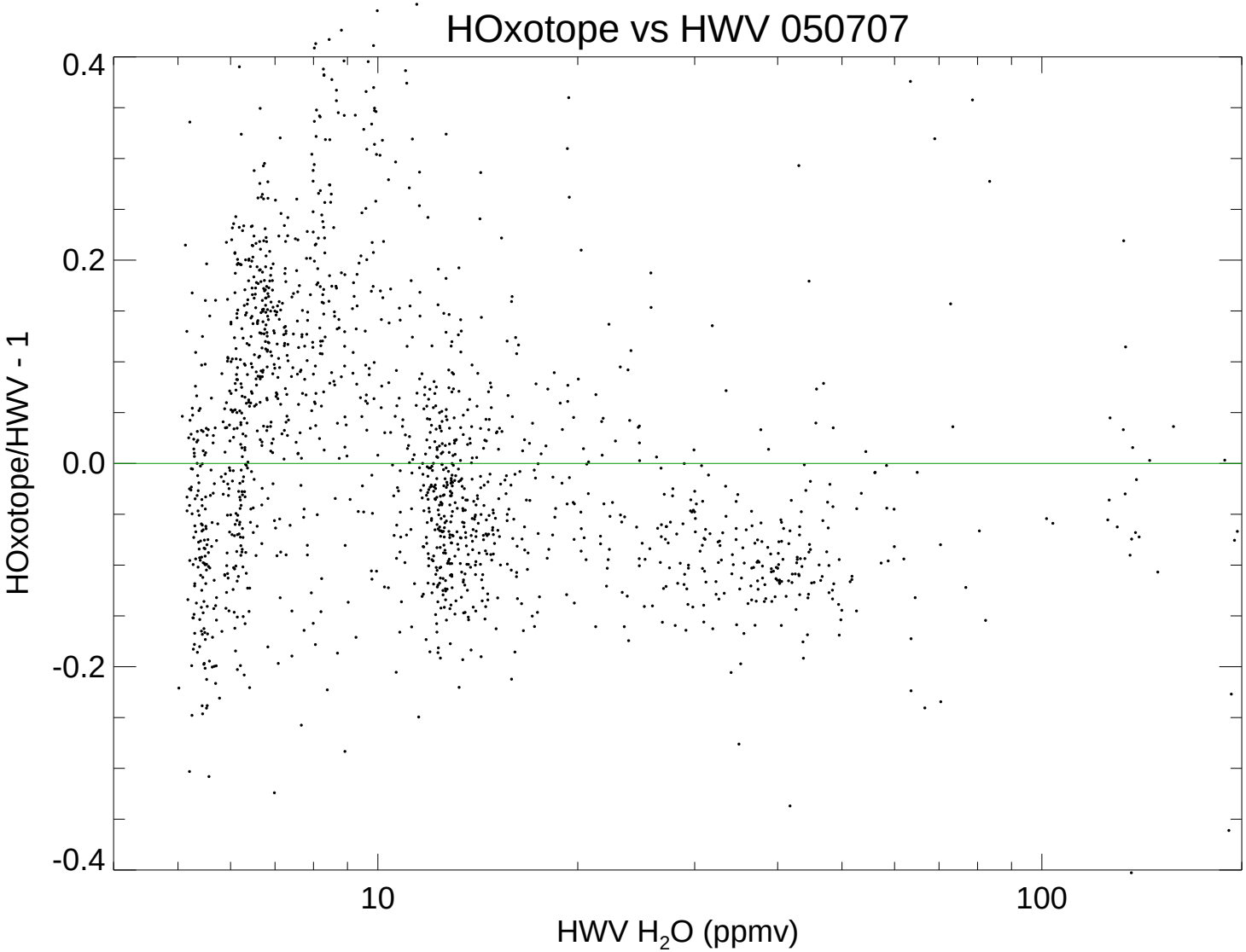

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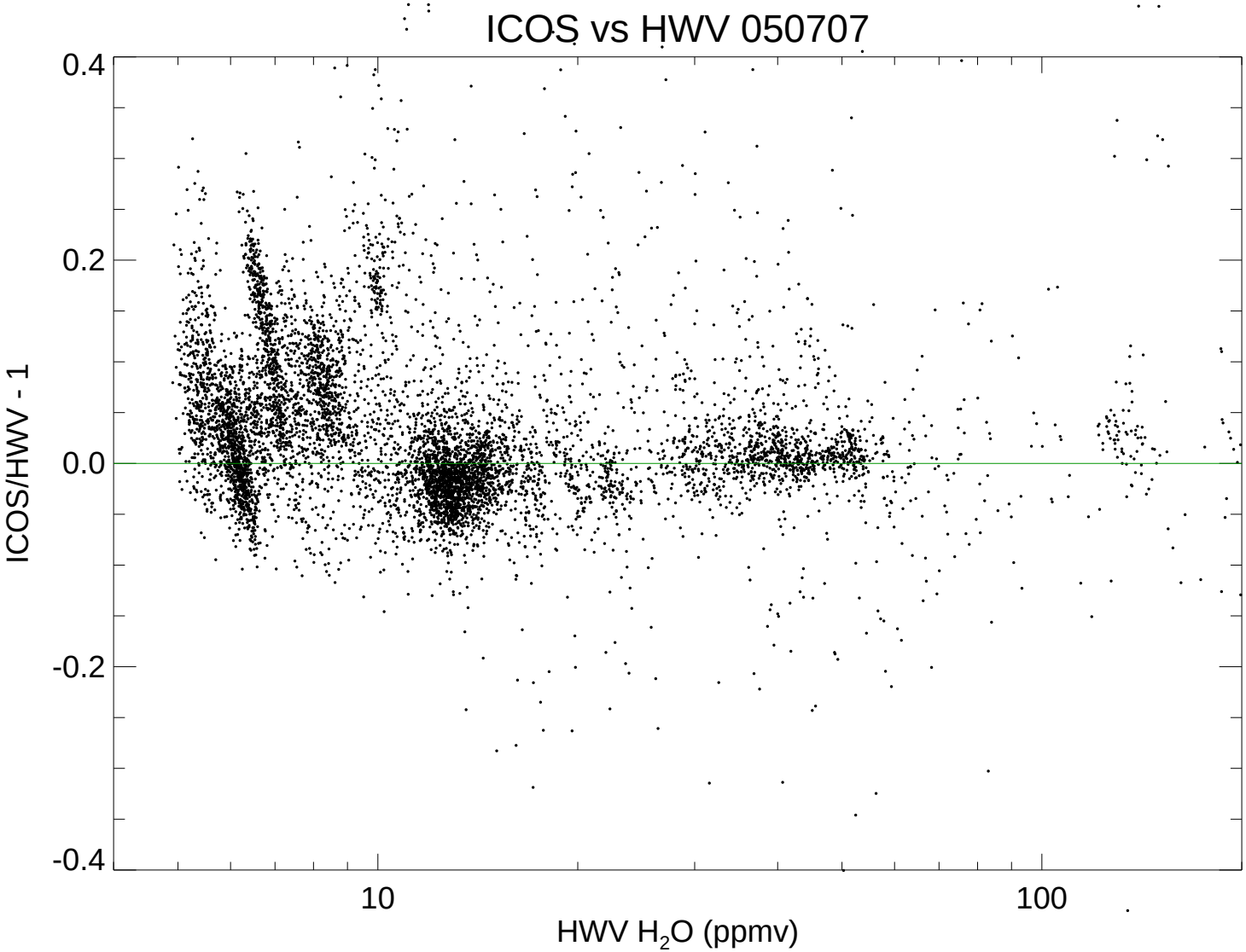
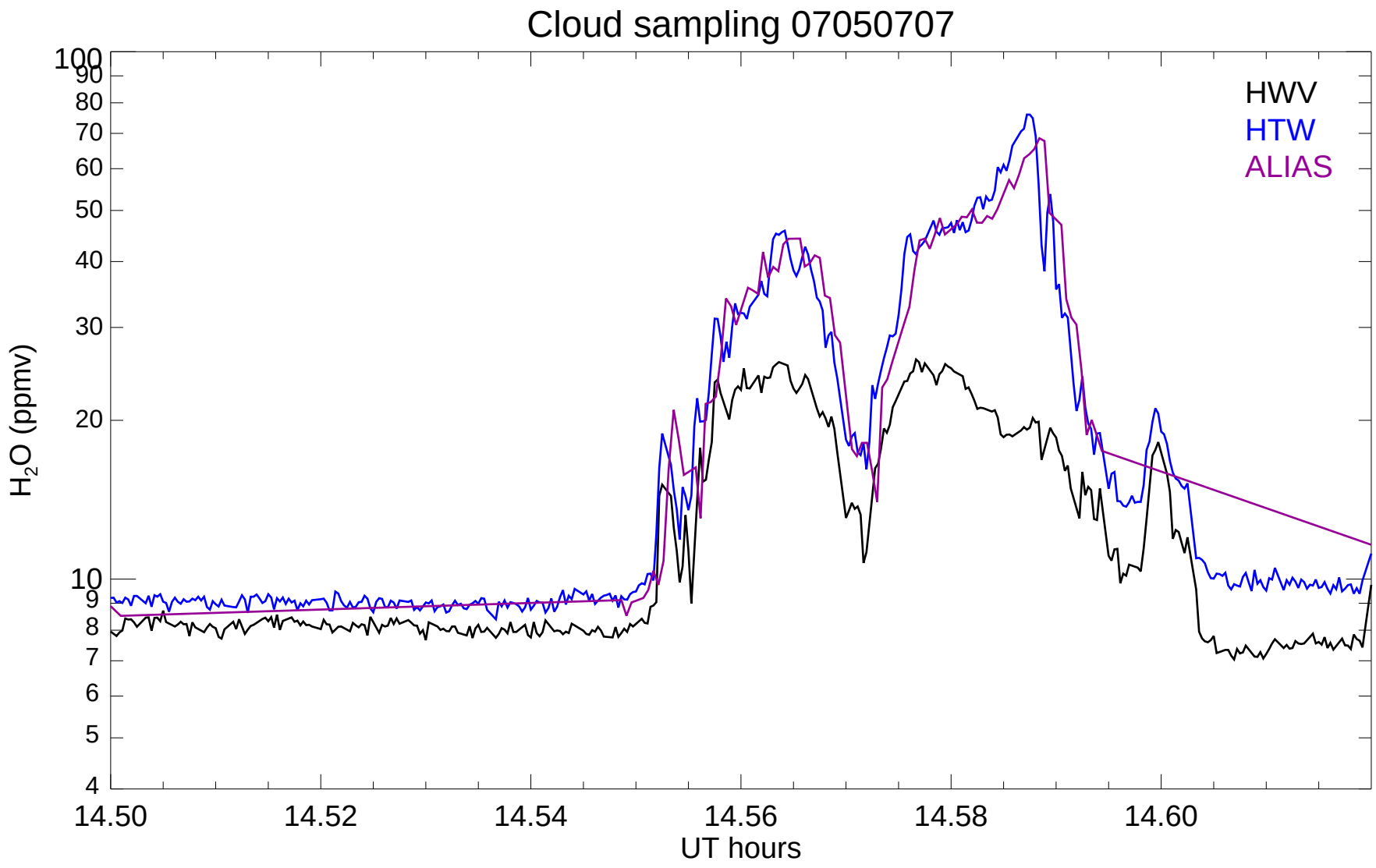


Total water vapor measurements



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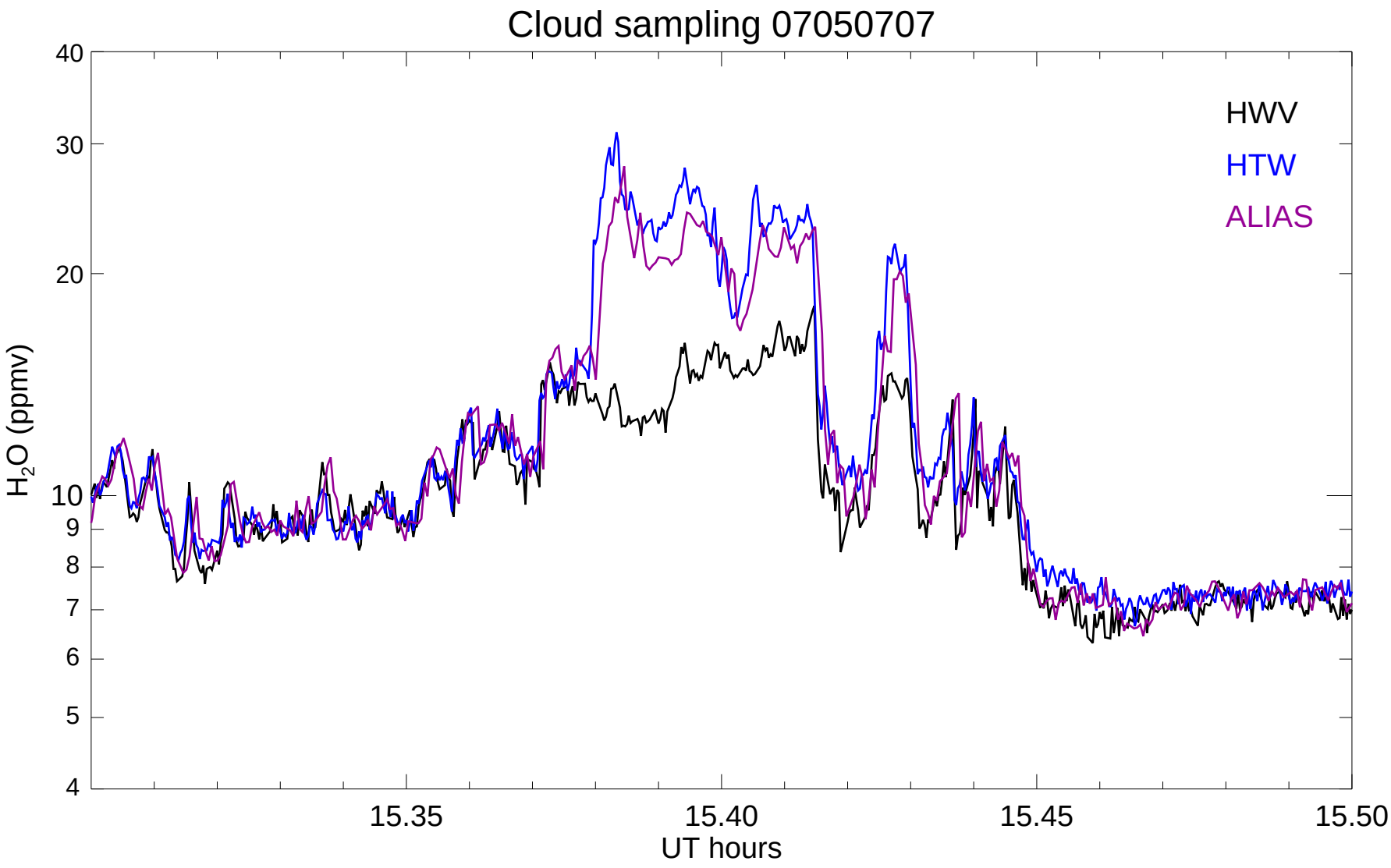

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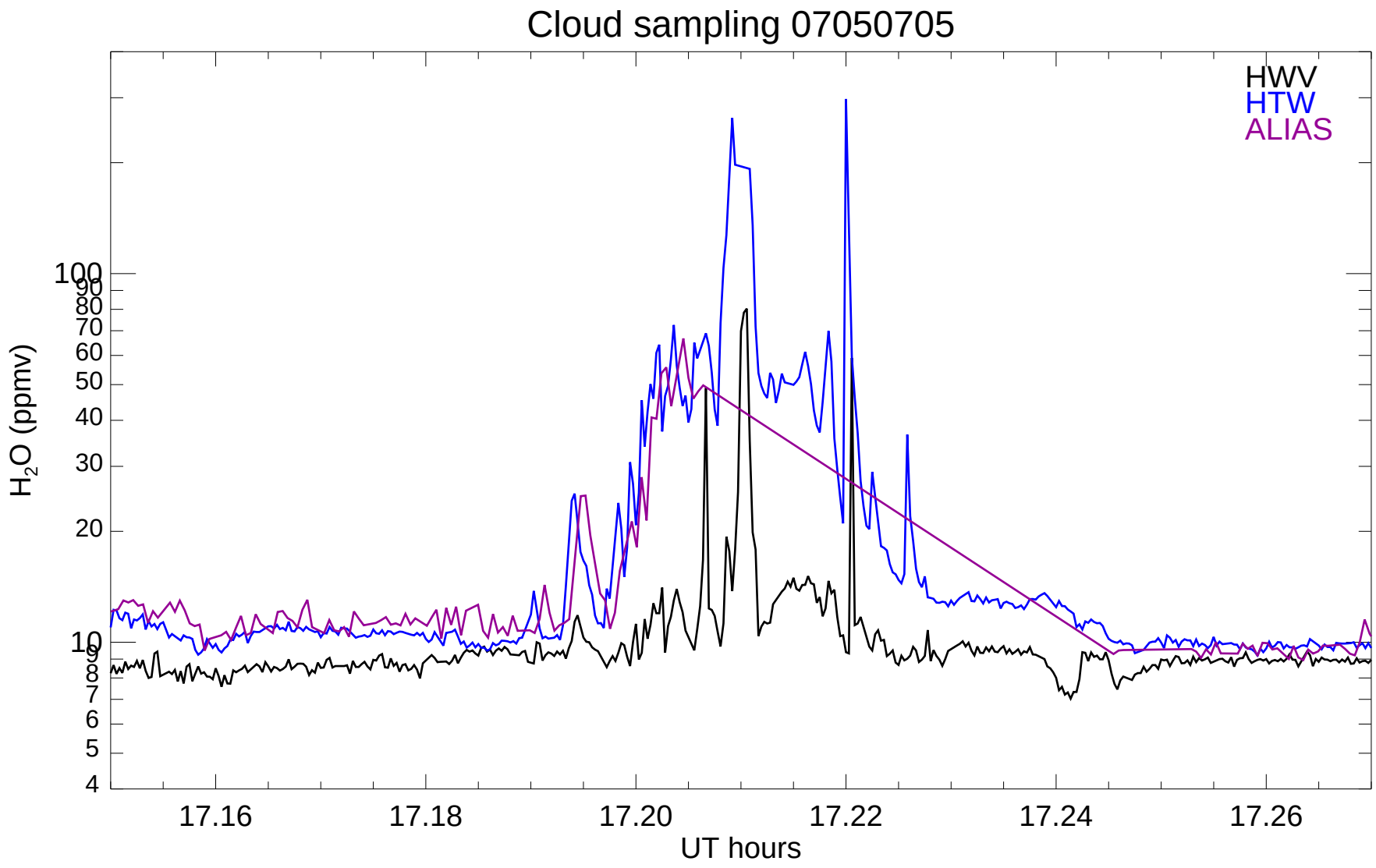
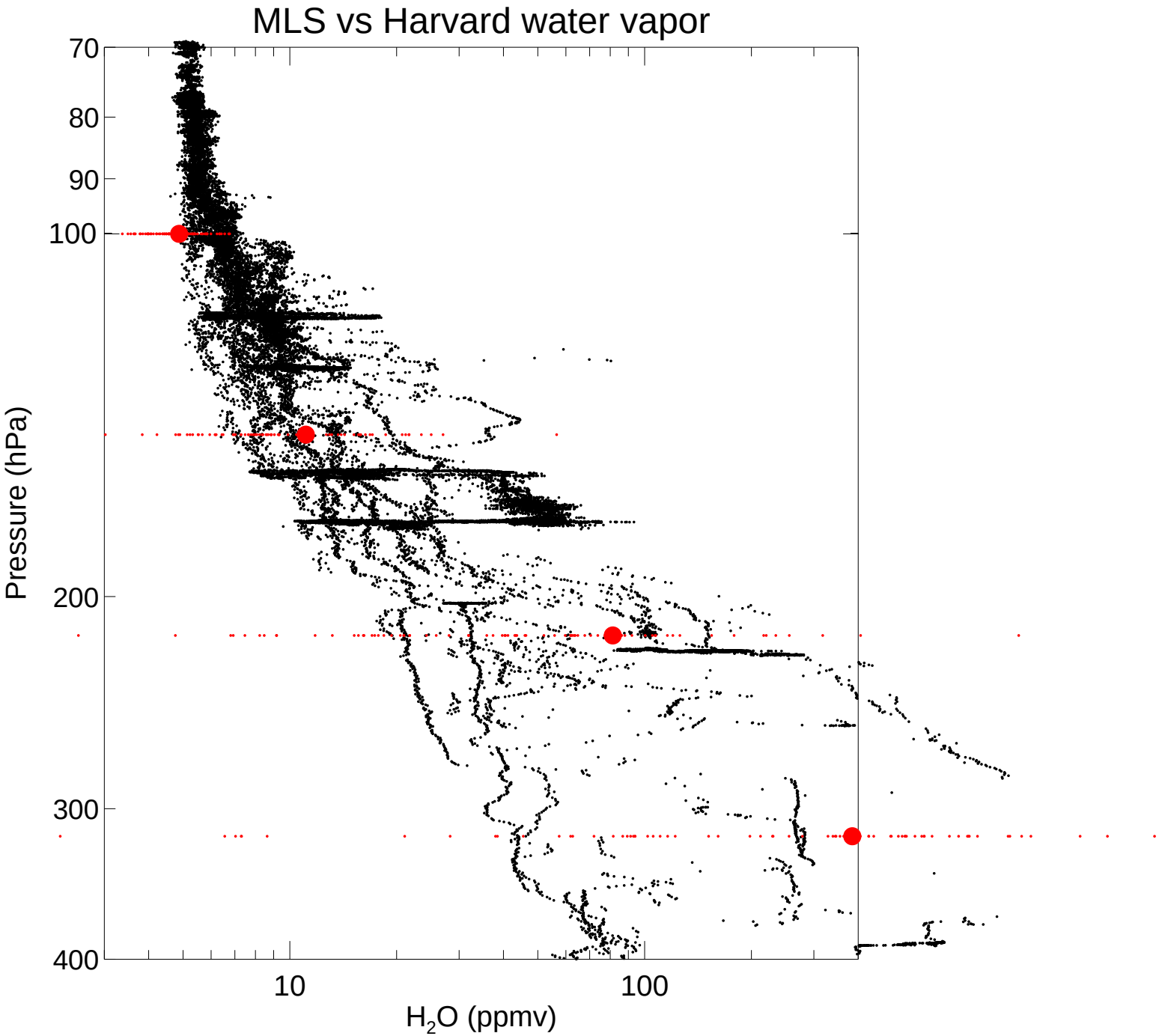
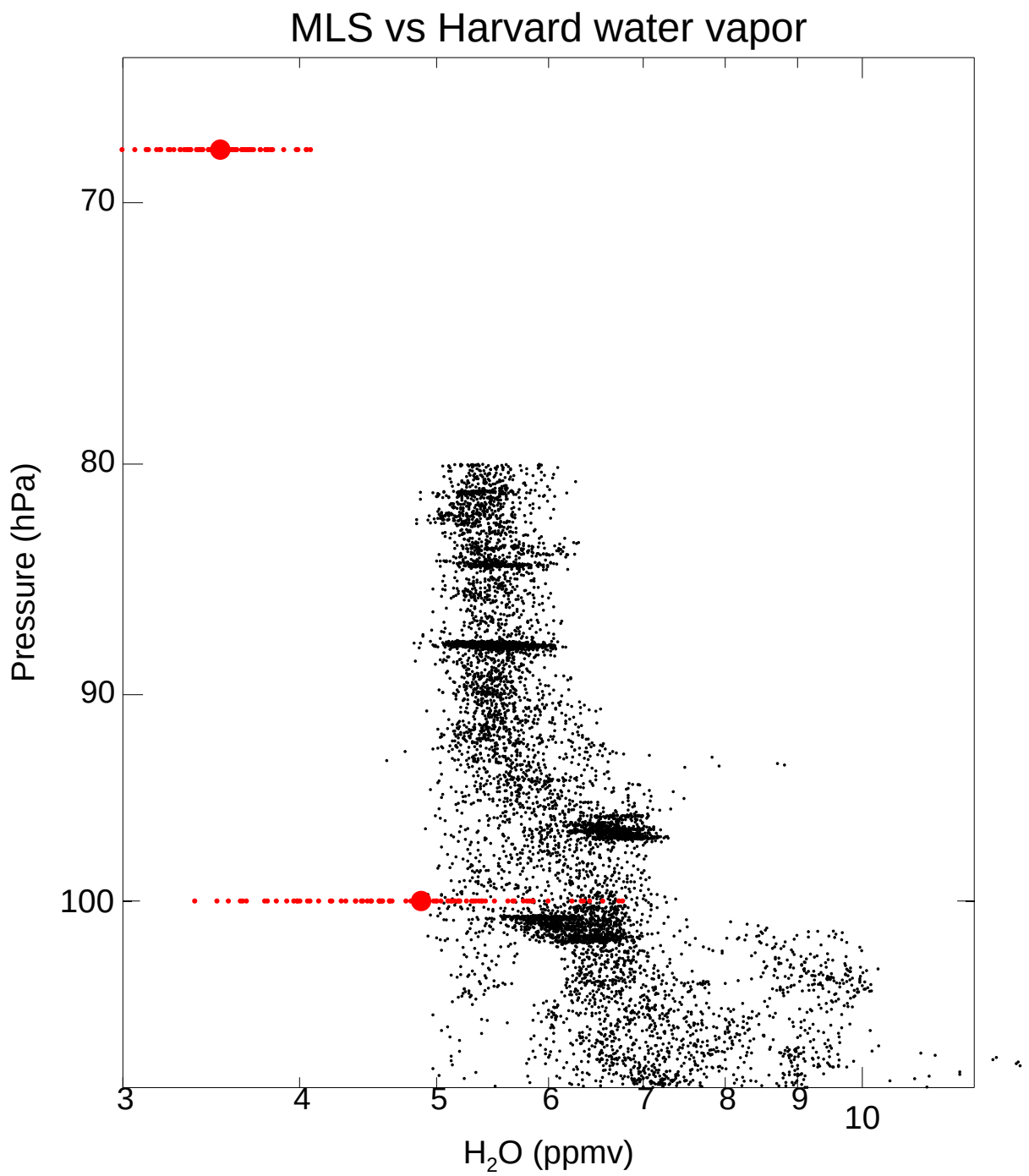
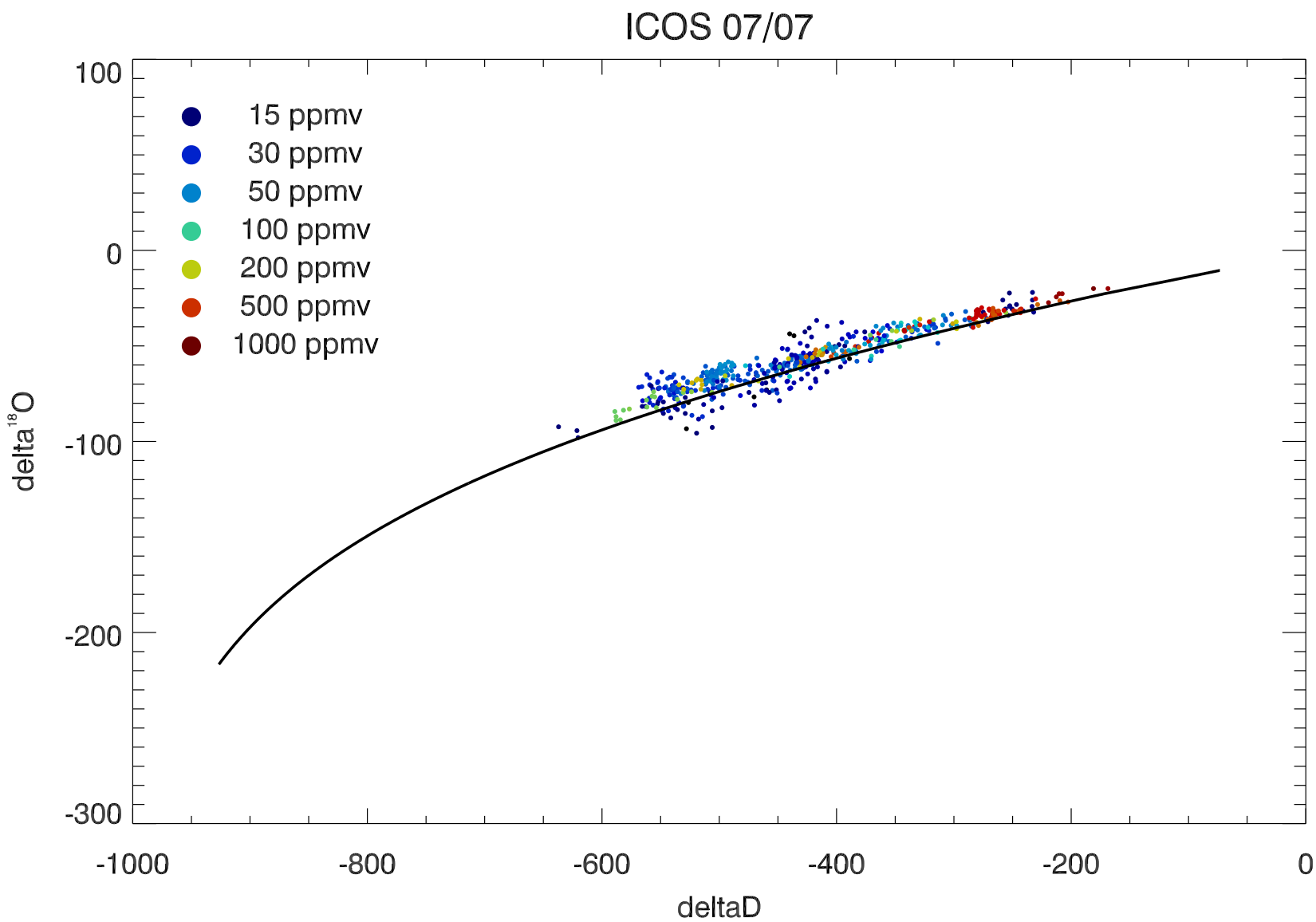


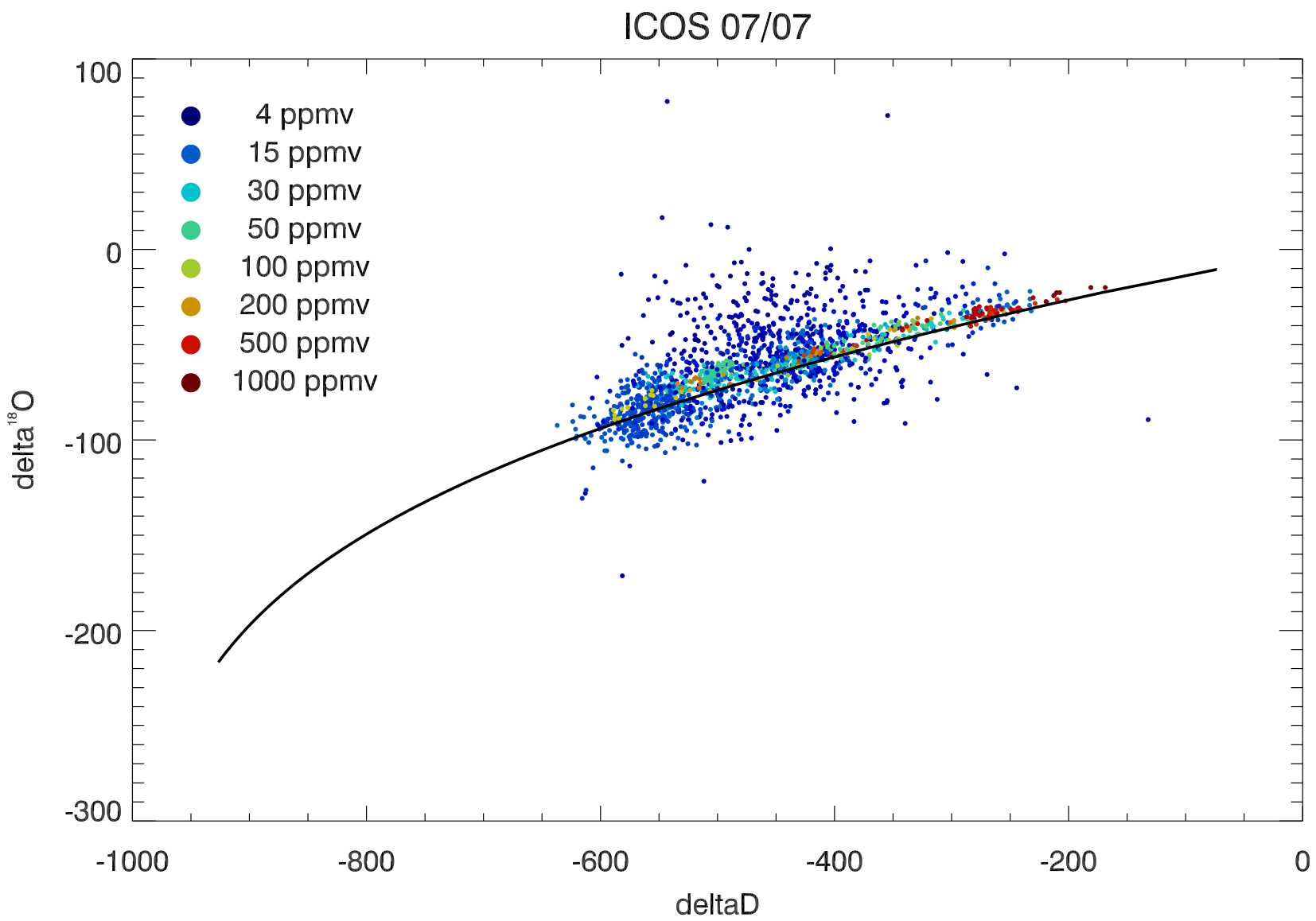

MLS vs Harvard water vapor
Pressure (hPa)
70
80
90
100
200
300
400
10
100
H_2O (ppmv)


MLS vs Harvard water vapor
Pressure (hPa)
70
80
90
100
3
4
5
6
7
8
9
10
H2O (ppmv)

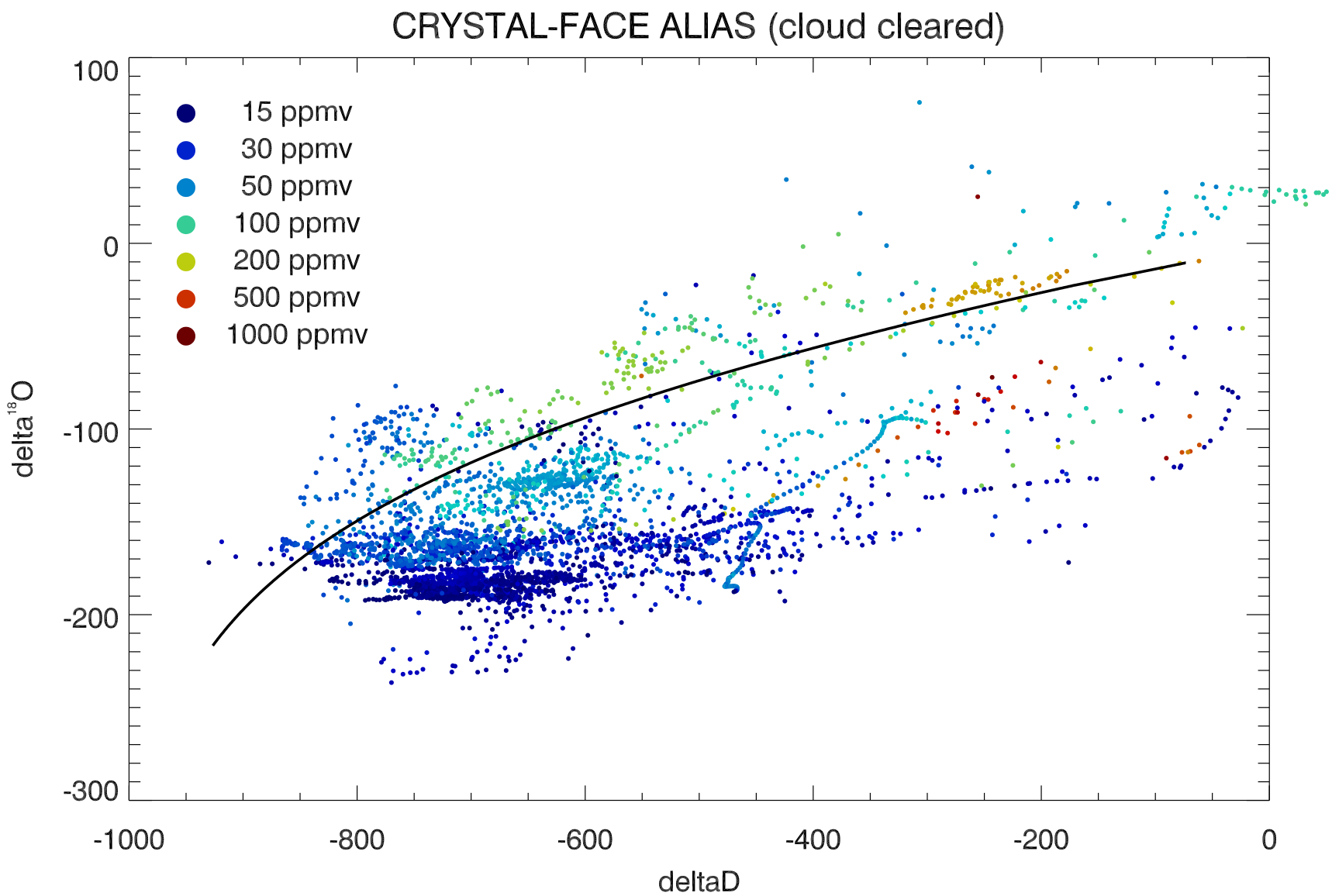
Metoric water line: ICOS $H_2O > 15$ ppmv



Metoric water line: ICOS all H_2O



Metoric water line: ALIAS CRYSTAL-FACE $H_2O > 15$ ppmv



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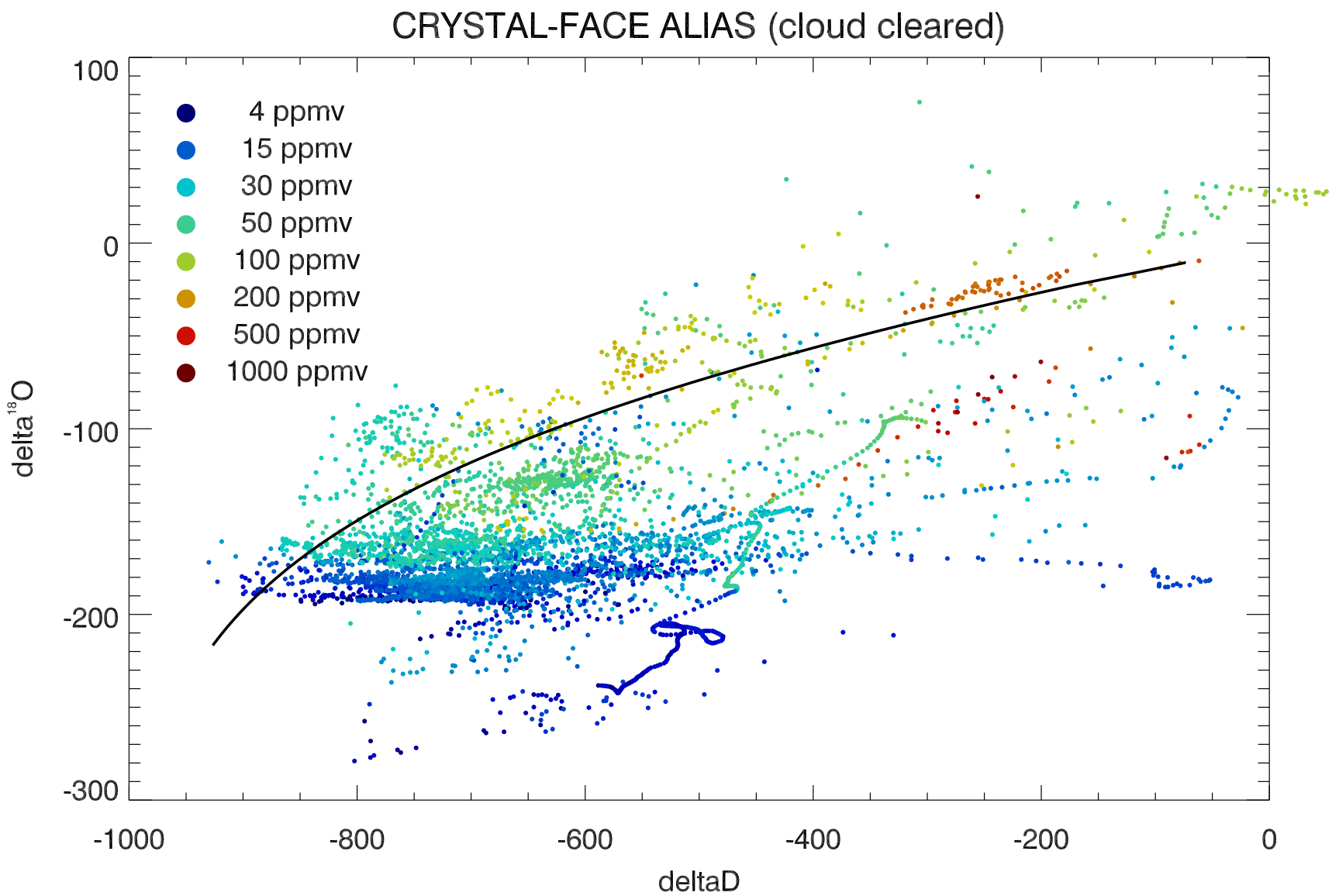

Summary

- Agreement between the six independently calibrated water measurements flown on the WB-57 is excellent.

- The new water vapor measurements are consistent with the long multi-year data record from the Harvard or JLH measurements.

- Some of the instruments have problems drying out after takeoff.

- Preliminary comparison between the ALIAS and Harvard total water measurements in cirrus indicates good quantitative agreement.

- MLS retrievals give lower water vapor concentrations in the lowermost stratosphere than the in situ measurements.

- δ-18 versus δ-D relationship shows good agreement with theoretical expectations.