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NDACC Working group on water vapor

Microwave activities at Bern (aircraft)

AMSOS – Airbourne Microwave Stratospheric Observing System

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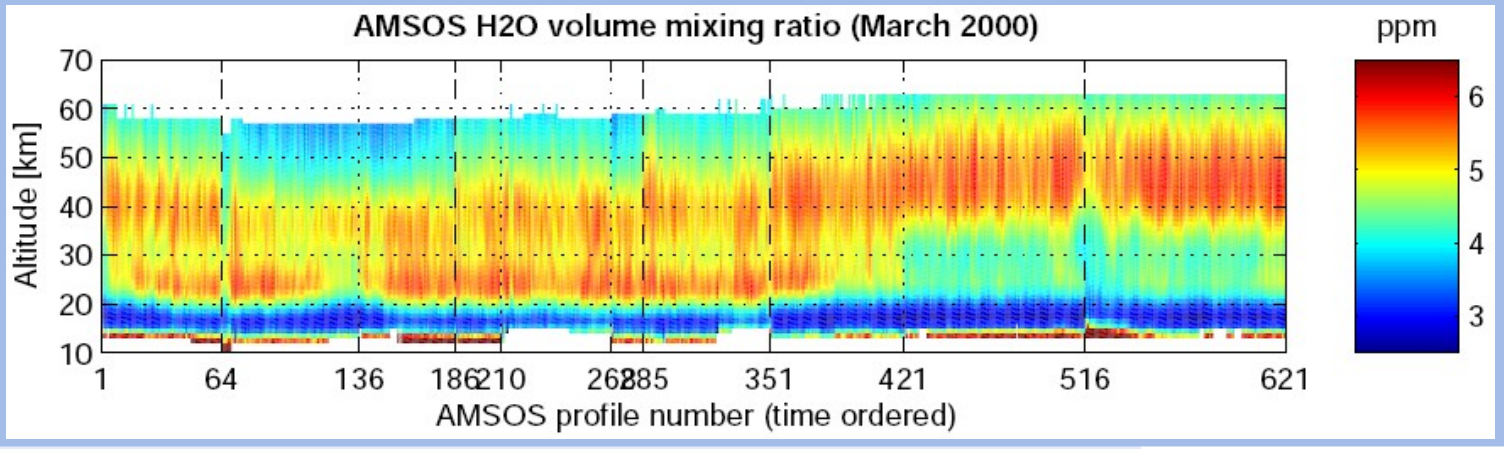
Overview

i. Airbourne Instrument AMSOS

ii. Flight campaigns

iii. Measurements & dataset

iv. Comparison to other instruments



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Technical description of AMSOS

- Total power radiometer
- Frequency range: 175,4-176,4GHz / 182,8-183,8GHz
- Observed spectral lines: O_3 (175,45 GHz), H_2O (183,31GHz)
- Calibration technique: Hotload – Coldload.
- Spectrometers:
  AOS, bandwidth 1 Ghz, resolution 1MHz (since 1998)
  AOS, bandwidth 50MHz, resolution 75kHz (1998-2004) *
  FFT, bandwidth 25MHz, resolution 12kHz (since 2005)
  FFT, bandwidth 1GHz, resolution 61kHz (since 2005)

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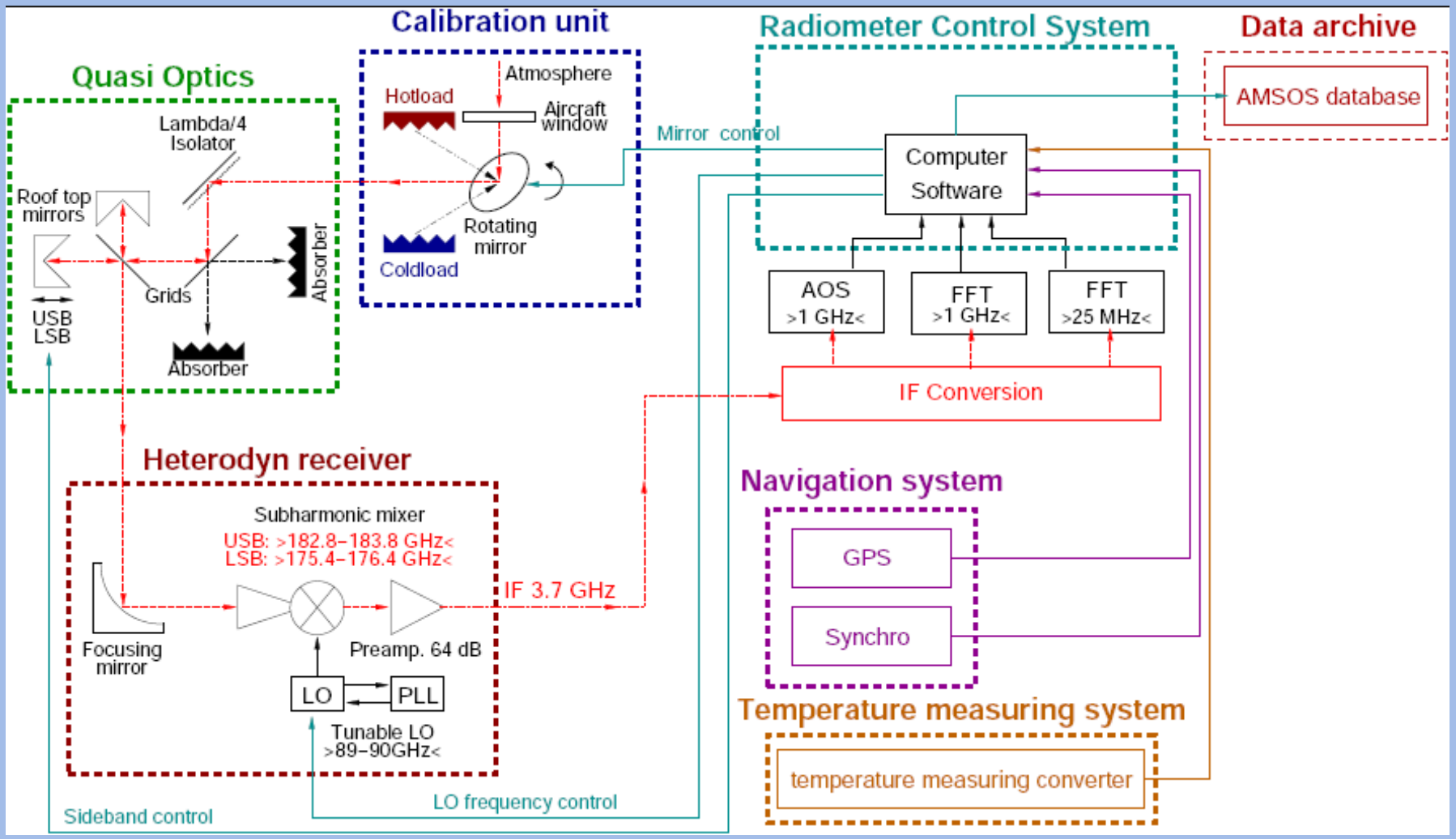
Scheme AMSOS



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Inside the aircraft (Learjet)

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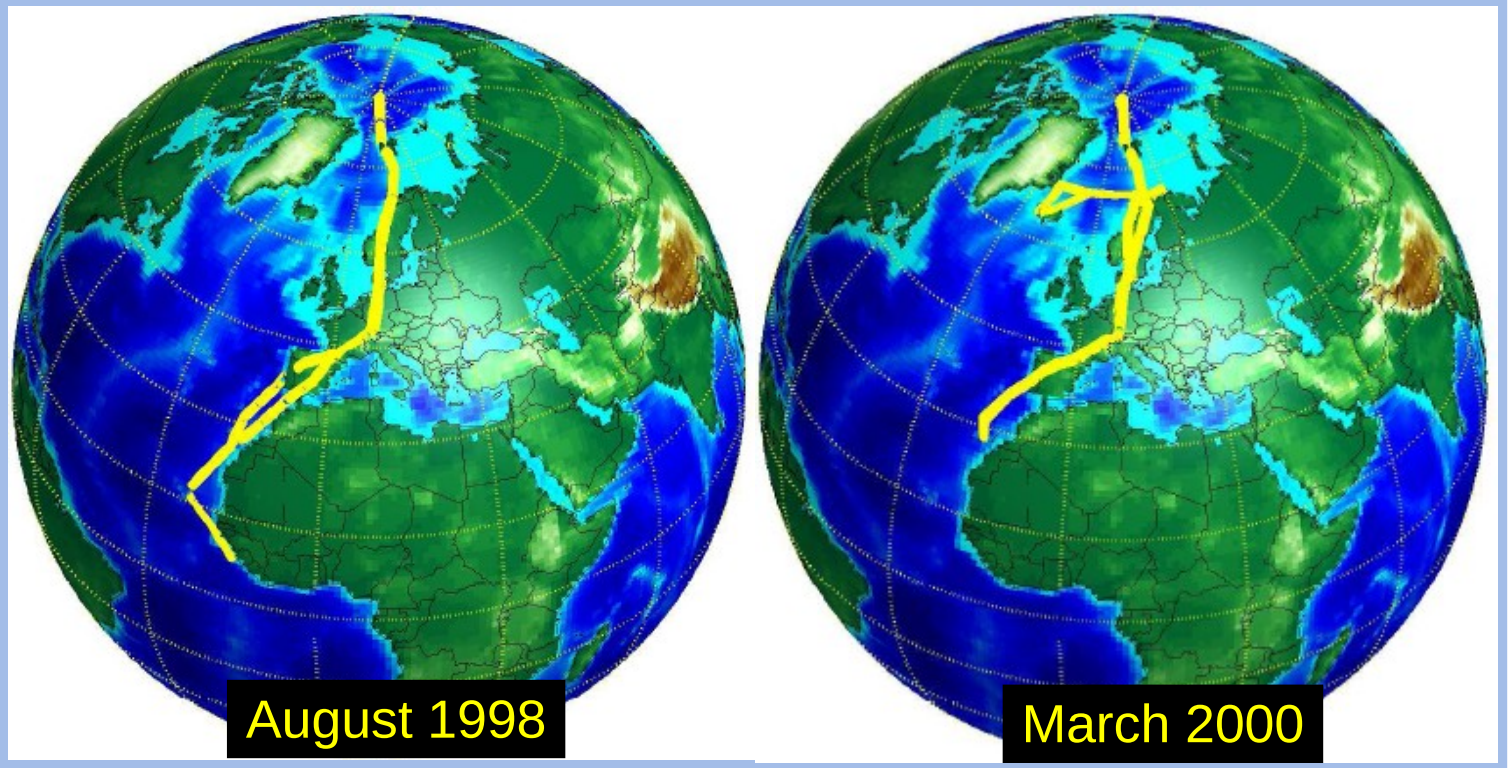
Flight campaigns: North-South

Latitudinal Observations

Aug 94
Oct 95
Mar 96
[R.Peter, JGR 1998]

Aug 98
Feb 99
Mar 00
Nov 01
Sep 02
(Nov 03)
(Feb 04)



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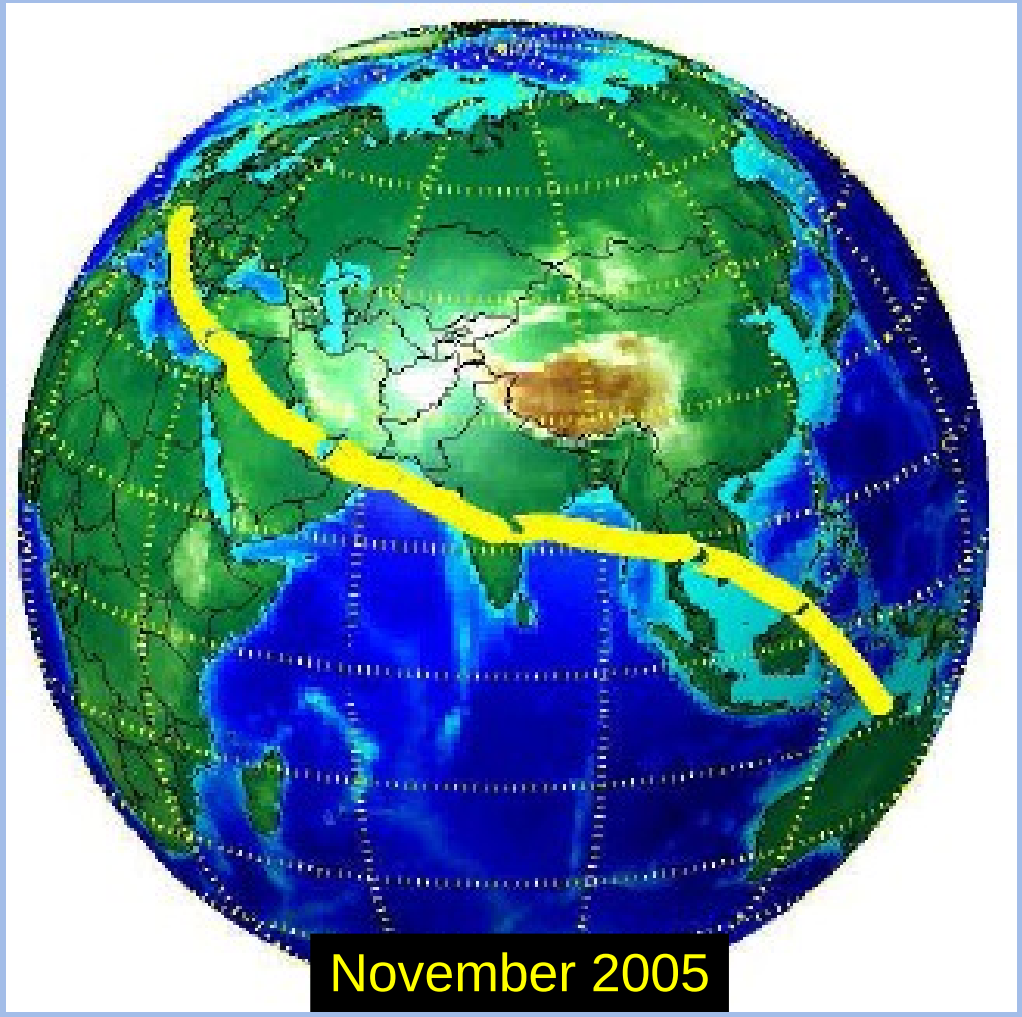
Flight campaigns: SCOUT-O3

Transferflight
Darwin Campaign
November 2005



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Flight campaigns: 2006?

Week 44:
30.10. - 05.11.2006

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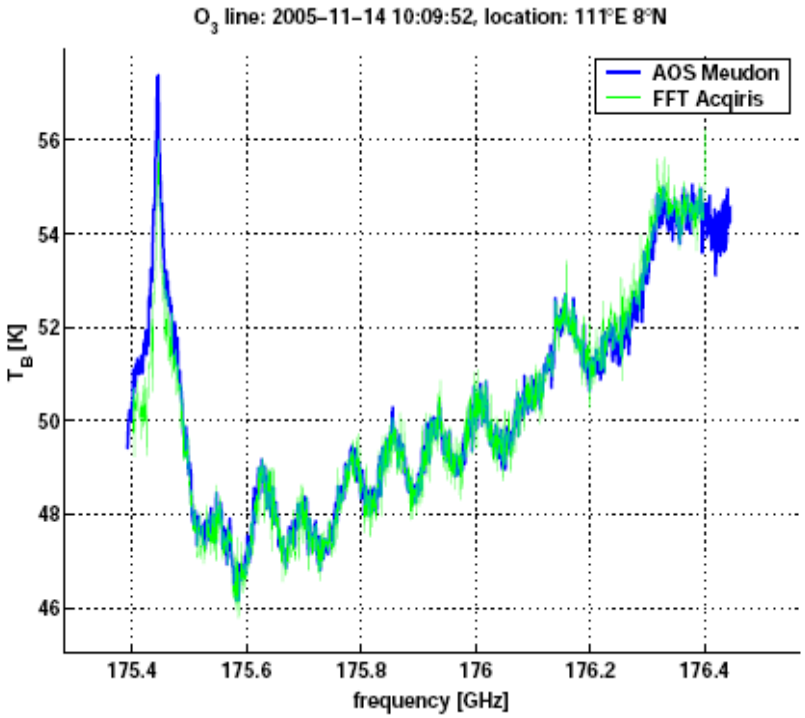
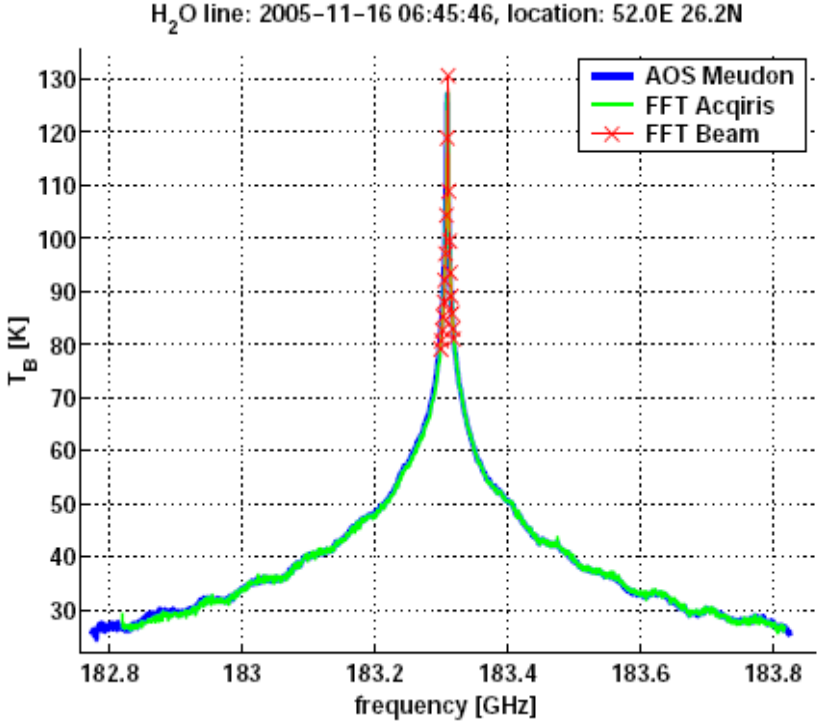
FFT Spectrometer measurements

Ozone



Water vapor



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Profile Retrieval

- Optimal estimation
- Software: Qpack / Arts
- Apriori: Mean profile of monthly means ERA-40
- Pressure, Temperature from ECMWF

- 2-D cut of the atmosphere along the flight track
- ~ 1 profile/min ⟶ 10-15km spatial resolution

- Available profiles from broadband AOS: ~15-60km

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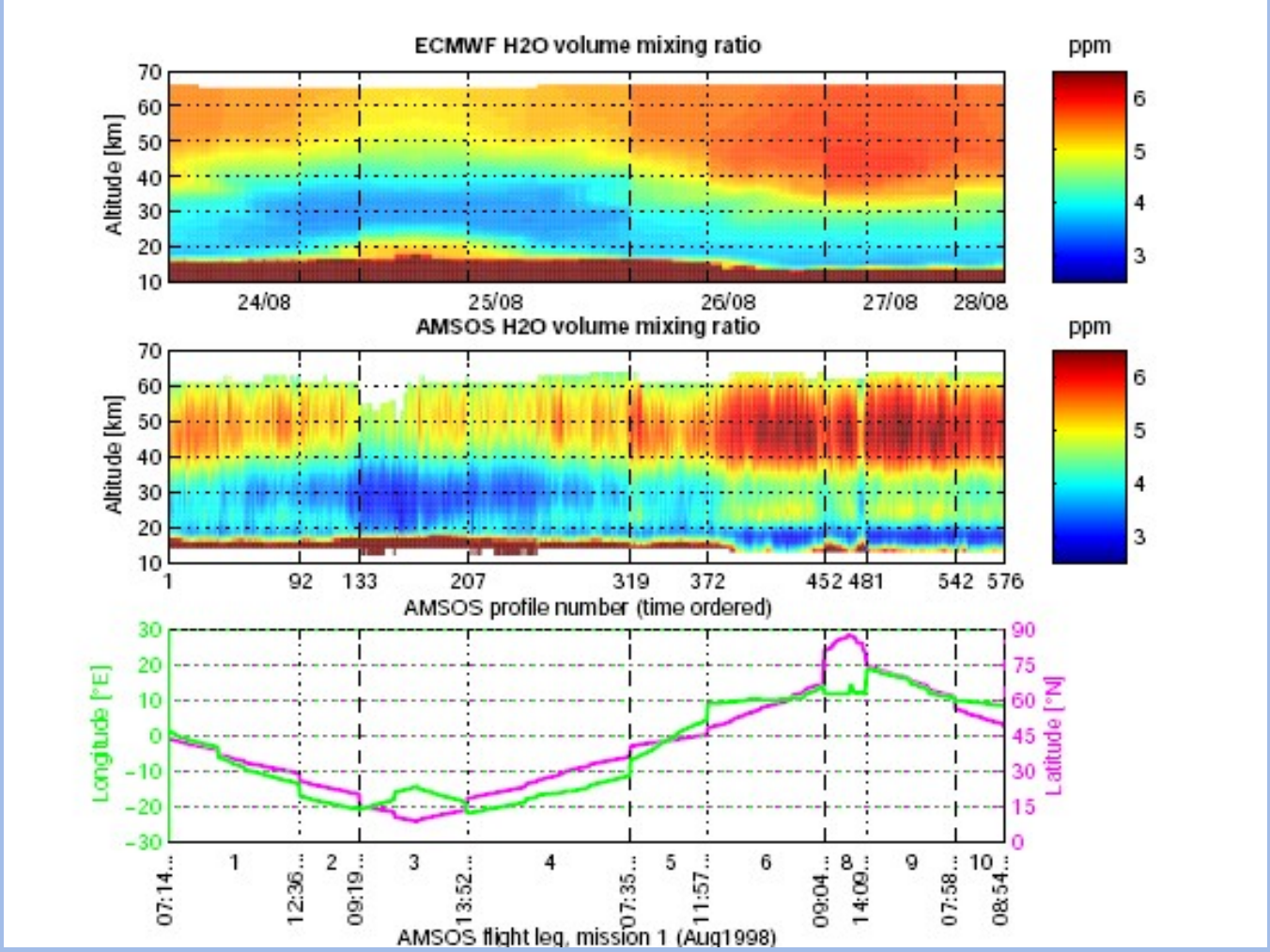
AMSOS and ECMWF: August 1998



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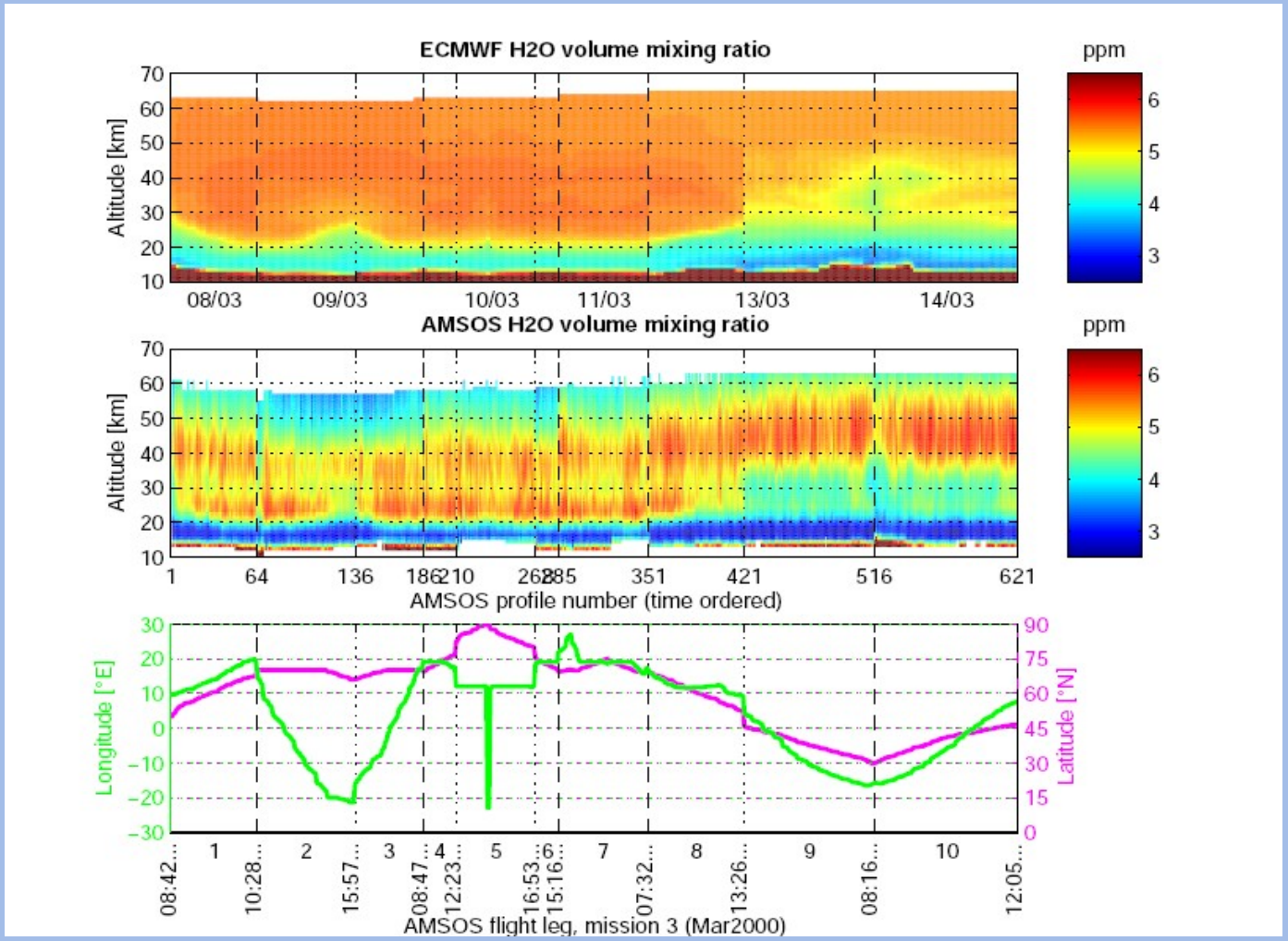
AMSOS and ECMWF: March 2000



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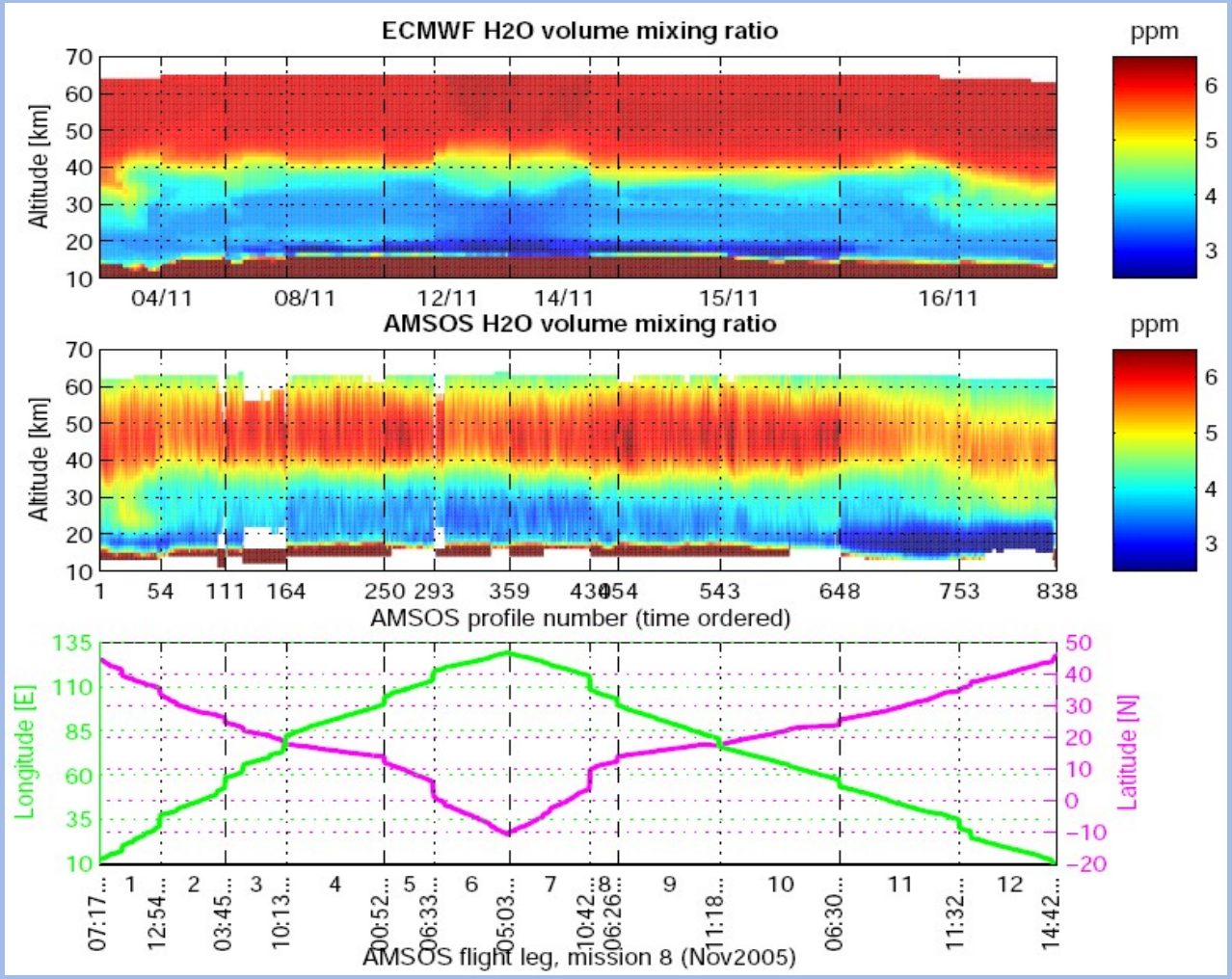
AMSOS and ECMWF: November 2005



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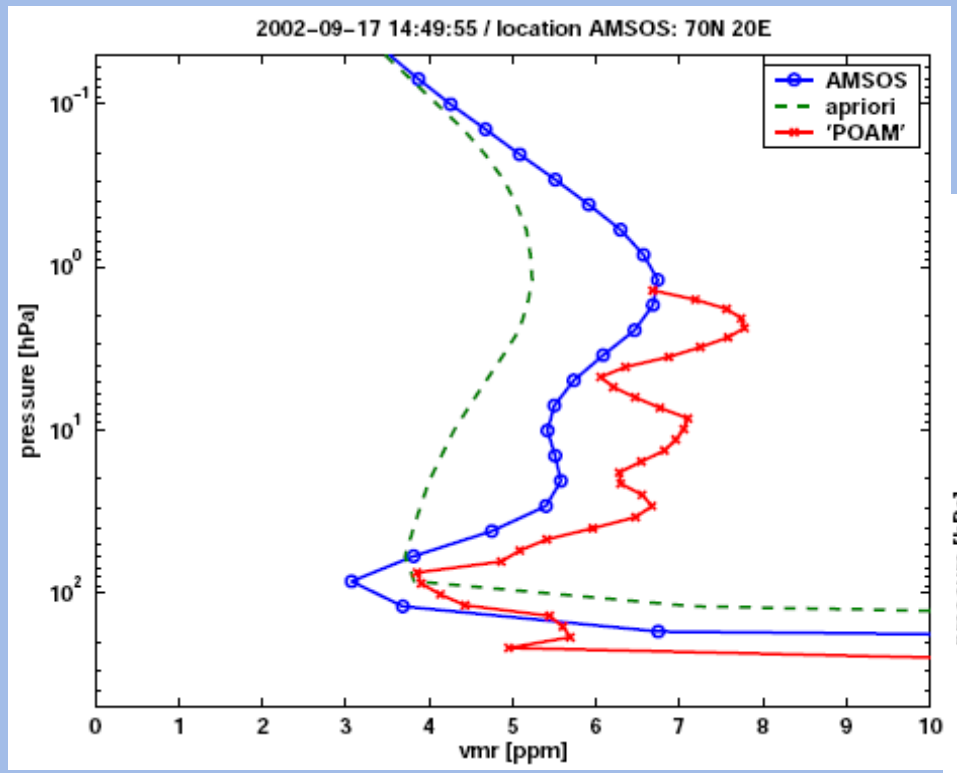
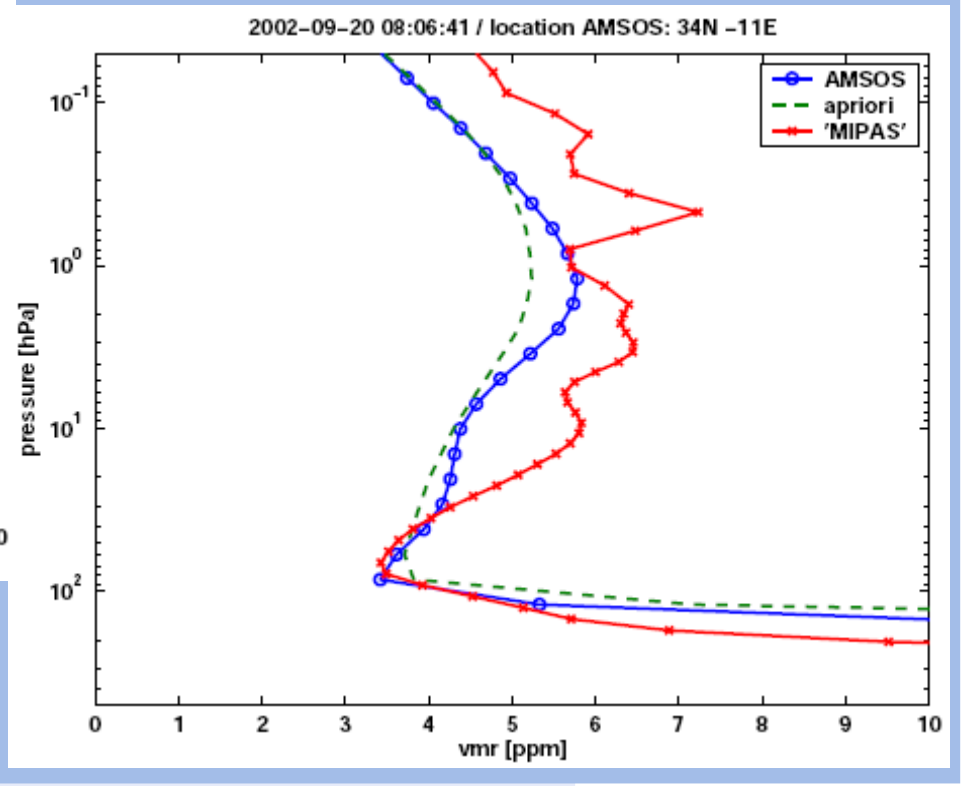
AMSOS and ...

POAM



MIPAS on ENVISAT



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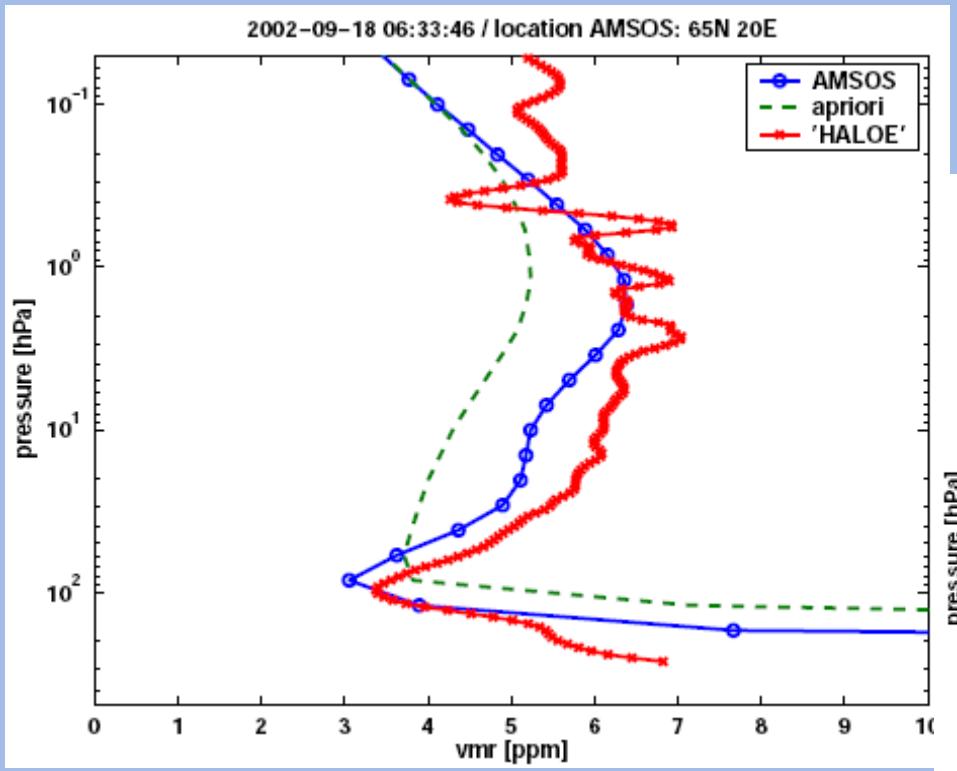
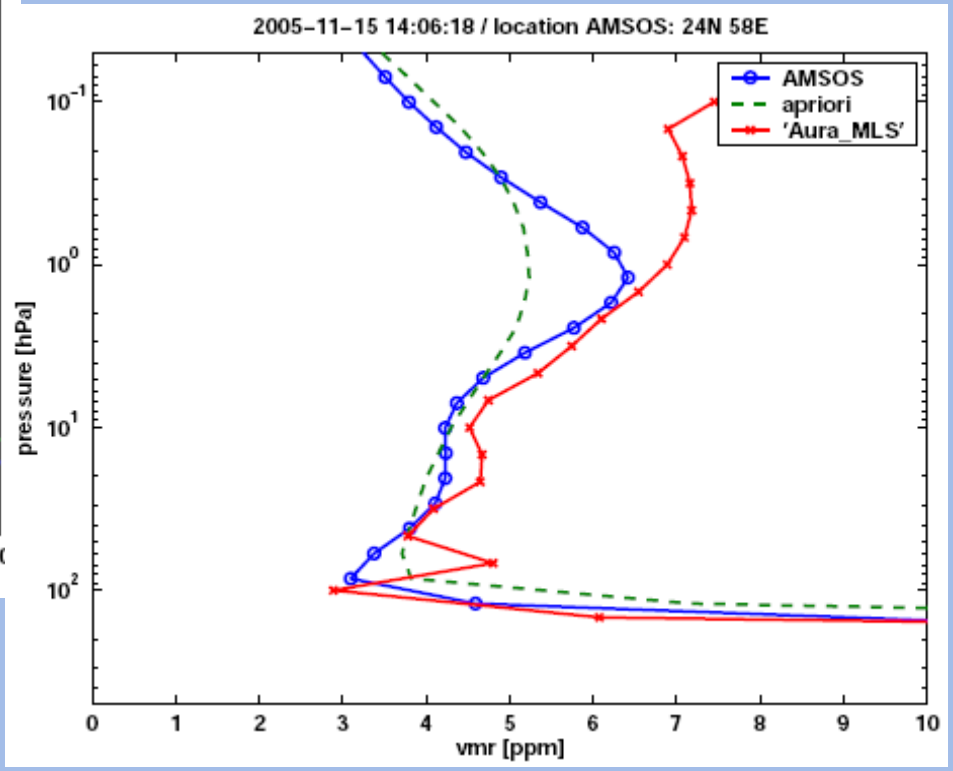
AMSOS and ...

HALOE



MLS on AURA



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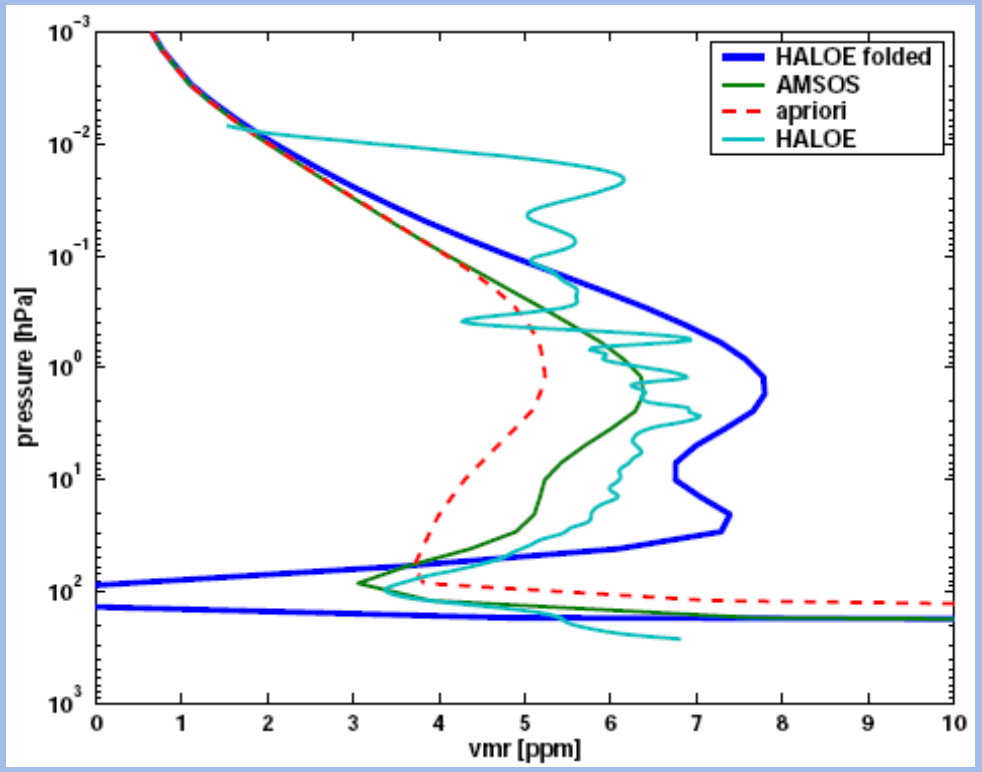
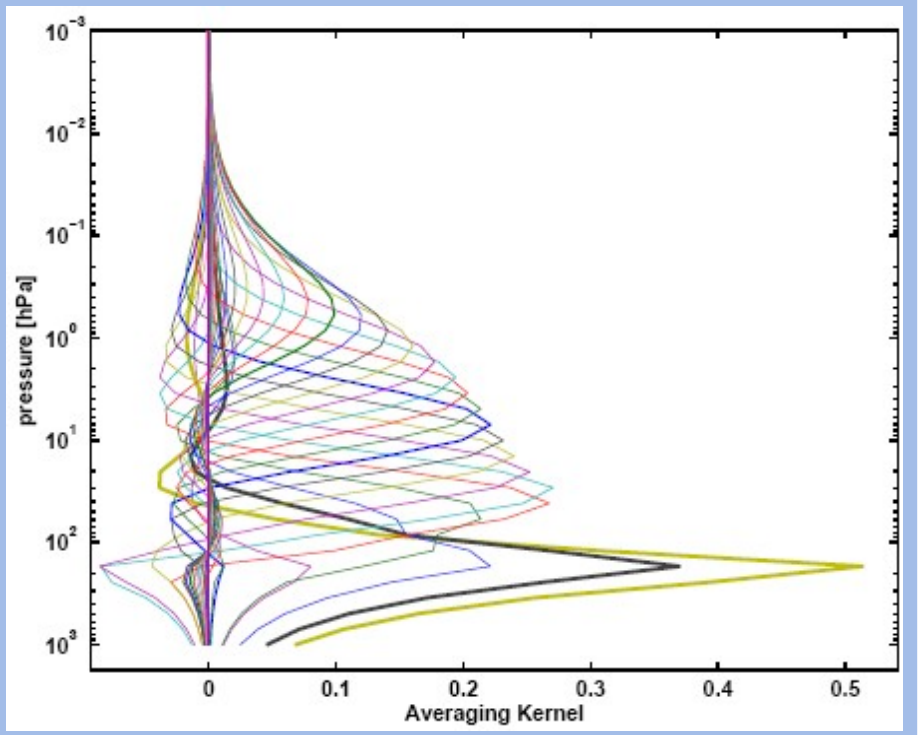
Folding with Averaging Kernels ???



$$\widehat{x_{sat}} = (I - A)\, x_{apriori} + A * x_{sat}$$



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Conclusion

- AMSOS: Airbourne instrument to measure H_2O in the middle atmosphere.
- Flight campaigns once year since 1994.
- Product: At the moment H_2O profiles from ~15-60km.
- Comparisons to other datas will be done.
- Question about folding profiles for comparisons in the UTLS region is an open question.

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Profile comparison