H_2O 6.a.1 MLS/satellite

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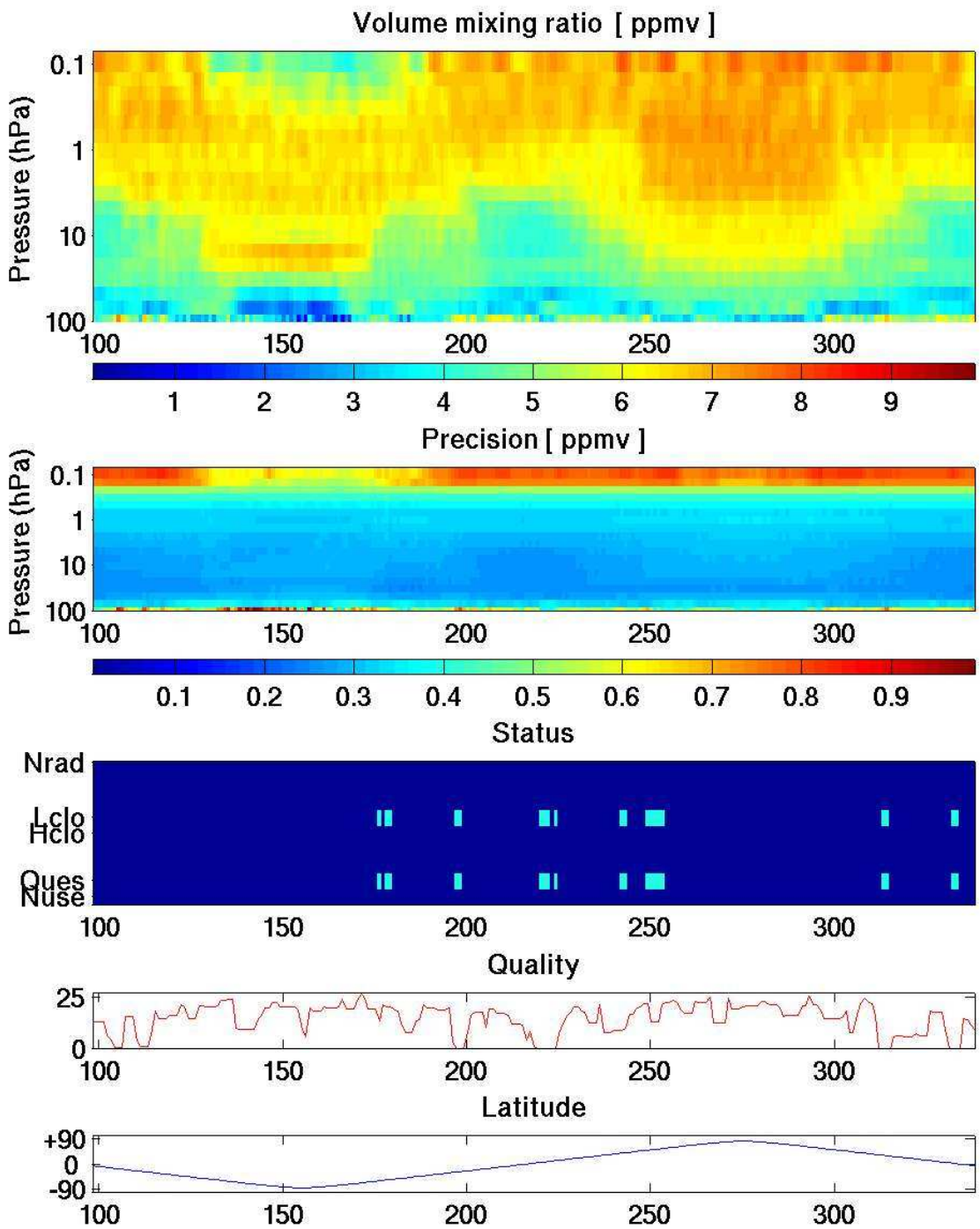
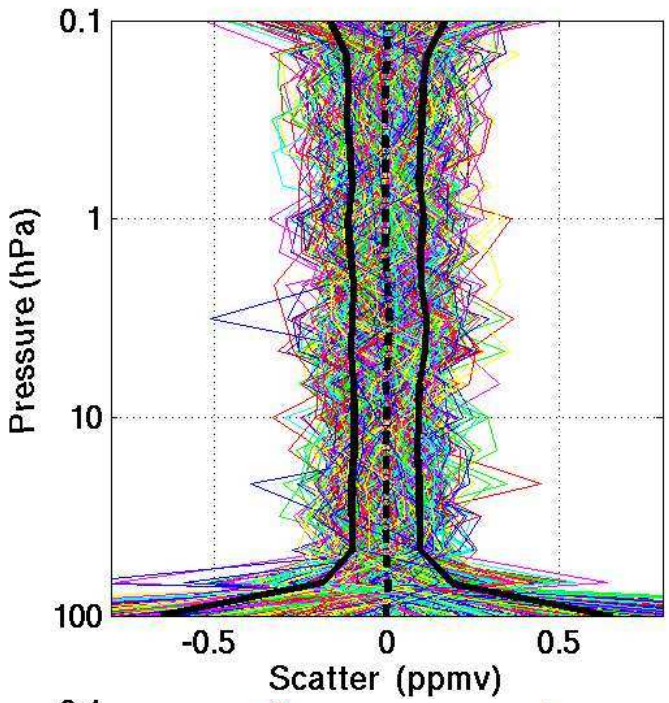
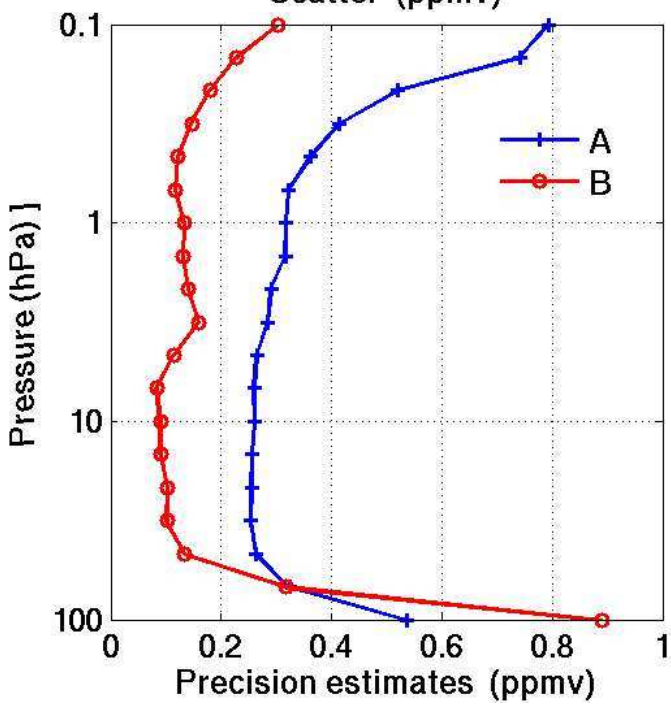
MLS H2O V1.5



- We concentrate here in the **stratosphere** and **lower mesosphere**.
- Shown **typical retrieval** for a day in the midle of September.
- **Retrieval range** extending to the lower mesosphere, next version will extend this range further up.
- **Precisions** – estimated retrieval random errors – in most of the stratosphere are around 0.3 ppmv.
- **Vertical resolution** is around 3 km for most of the stratosphere.

MLS H2O – Precision





- Measuring true precision by observing the **scattering** in regions with little atmospheric variability.

- Checking the scattering for 800 profiles in the **tropical stratosphere**, little H2O variability expected.

— Standard deviation of de differences between consecutive profiles in tropical region 5S–5N

— A Estimated precision by retrieval algorithm (combination of radiance and a priori uncertainties)

— B Standard deviation of profiles in tropical region 5S–5N (estimation of error from radiance terms)

MLS H2O – Accuracy

- Starting some preliminary comparisons with other **satellite data** sets:

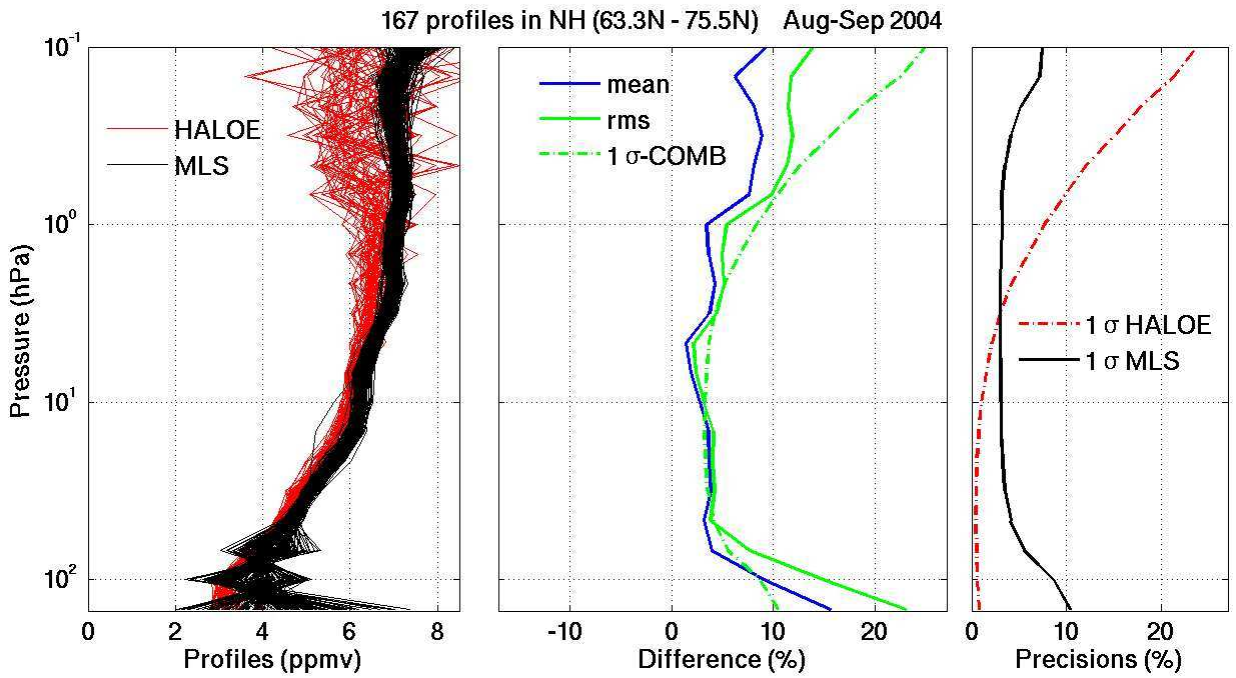
HALOE
SAGE–II
ACE

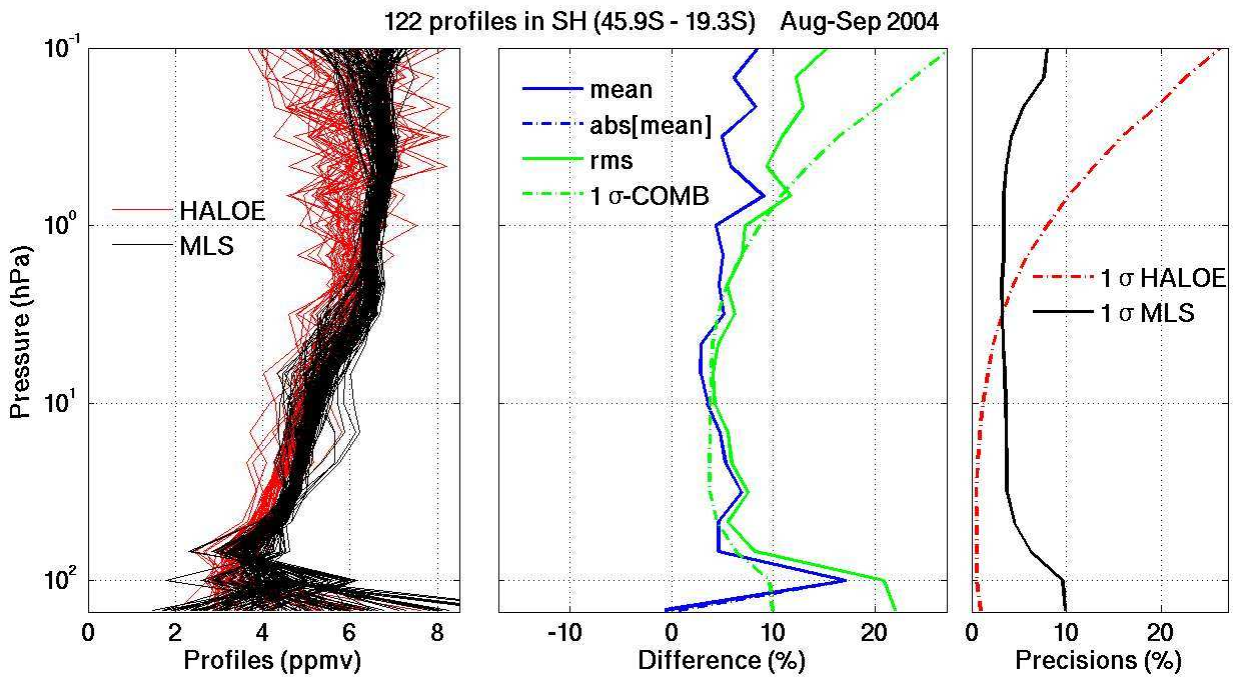
- Comparisons done for 6 days in **August–September 2004** where the was MLS v01.5 data and correlative measurements from the three satellite instruments.

- Correlative measurements interpolated to MLS retrieval grid, **coincident pairs** between MLS and correlative measurements extracted by:

Δ lattitude = ± 2 ° Δ longitude = ± 12 ° Δ time = ± 7 hours

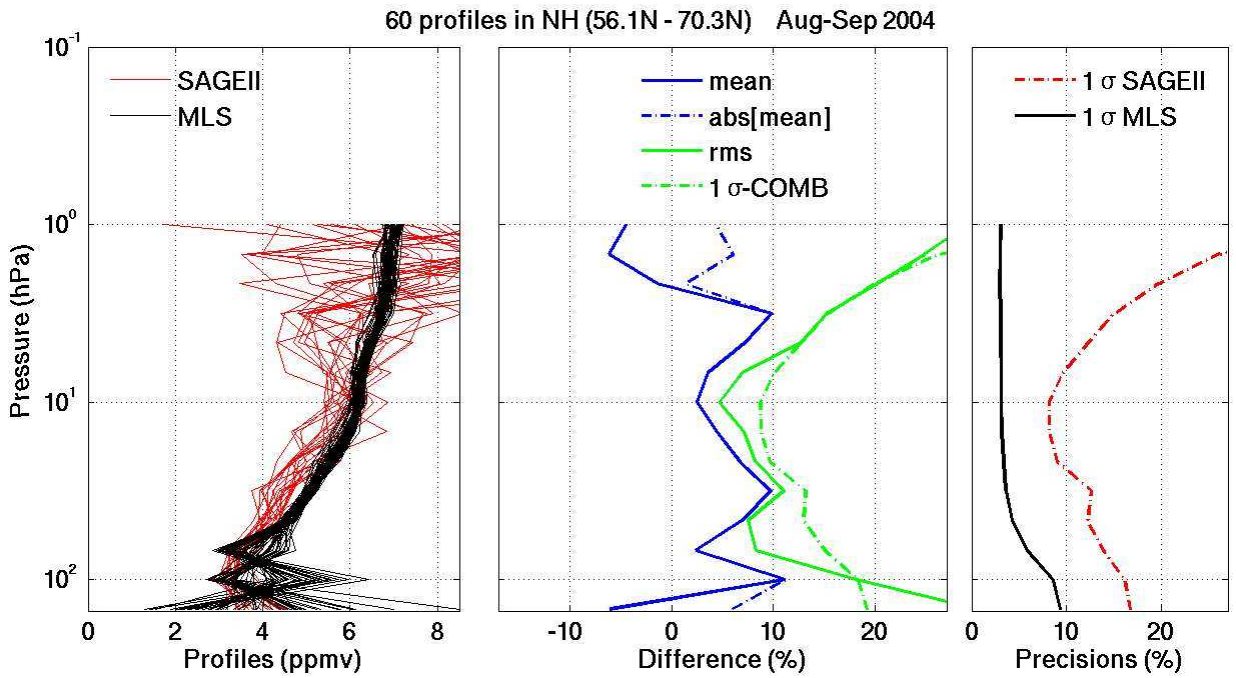
MLS[V01.5] – HALOE[V19]

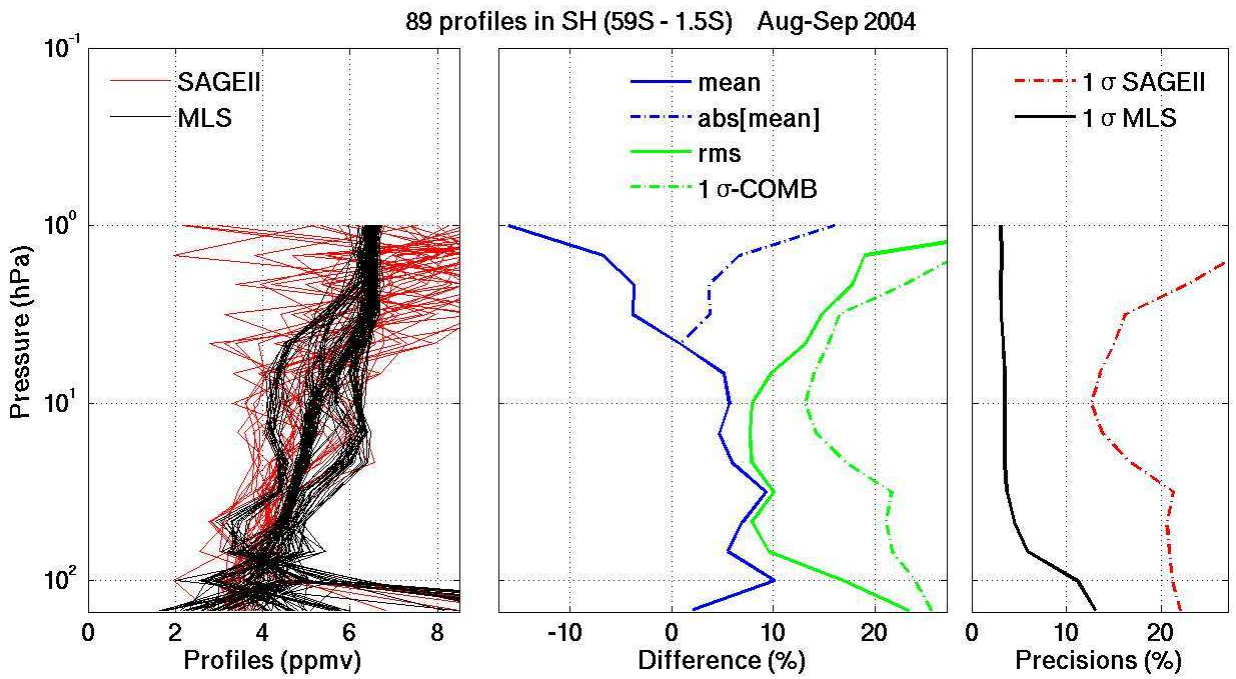




- HALOE vertical resolution is ~2 km, comparable to MLS.
- Notice zigzagging of MLS pofiles in the lower stratosphere.
- MLS consistenly wetter than HALOE.

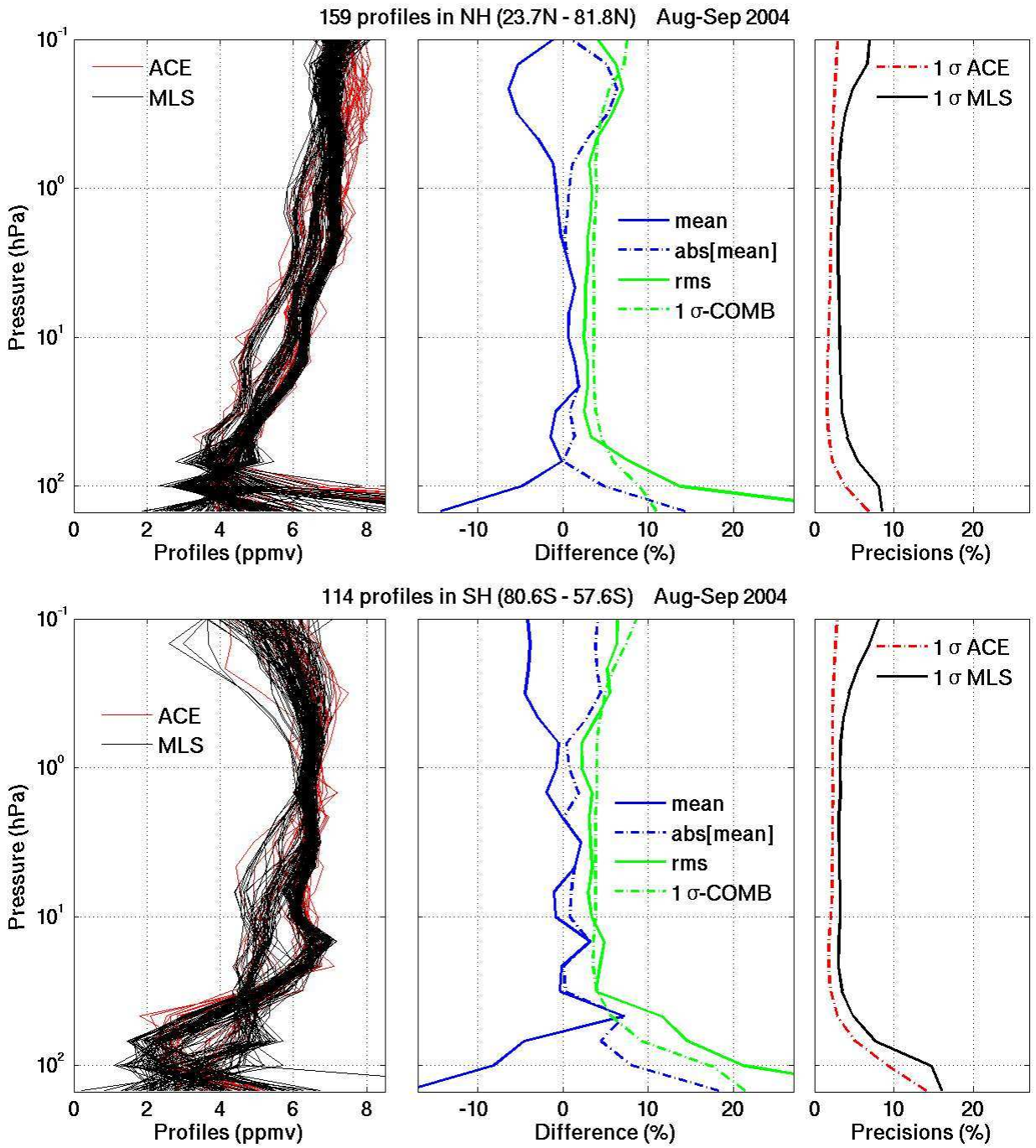
MLS[V01.5] – SAGE[V6.2]





- SAGE vertical resolution is ~500 m, smaller than MLS.
- Notice zigzagging of MLS pofiles in the lower stratosphere.
- MLS wetter than SAGE in lower–middle stratosphere, but drier in upper stratosphere.

MLS[V01.5] – ACE[V2]



- Non-validated ACE data, courtesy of the ACE team.
- ACE vertical resolution is ~ 3–4 km, comparable to MLS.
- MLS drier in the lower mesosphere, changing from drier to wetter in the upper-middle stratosphere, drier again in the lower stratosphere.

MLS H2O Summary

Pressure, hPa	Vertical Resolution, km	"True" Precision, ppmv	Estimated Precision ppmv	Estimated Accuracy Difference HALOE	Difference SAGEII	Difference ACE
0.1	6	0.3	0.8	+9%		−5%
1	4	0.1	0.3	+4%	−10%	−2%
10	3	0.1	0.3	+3%	+4%	+1%
100	3	0.8	0.5	+11%	+10%	−10%

Main issues to be addressed for **next version**:

- Removing observed **zigzagging** in the lower stratosphere, trying to get better radiance closure in that region.
- Extending **retrieval vertical range** further up into the mesosphere, working towards a better tuning of the smoothing constrains in that part of the atmosphere.
- Further **validation**, interesting that MLS is consistenly wetter than HALOE.