

Comparisons between WVMS, POAM, and MLS

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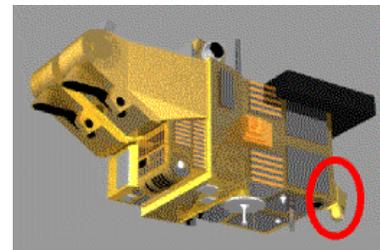


WVMS and POAM characteristics

- WVMS:
 - 22 GHz ground-based radiometers measuring from NDSC sites in Lauder, New Zealand, Mauna Loa, Hawaii, and Table Mountain, California.
 - Standard retrievals: 40-80km, 1-week integration
 - Shorter integrations okay for lowest altitudes
 - Retrievals below ~40 km stable over limited time periods



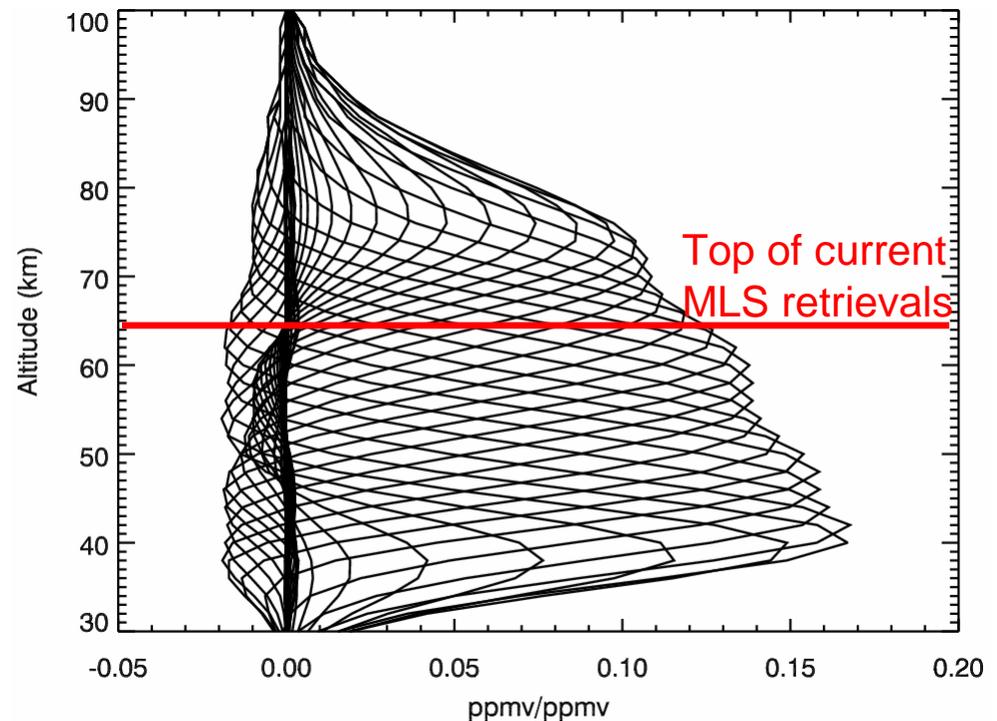
- POAM:
 - Solar occultation: 14 measurements/day
 - High latitudes
 - Upper troposphere to stratopause



Vertical Resolution

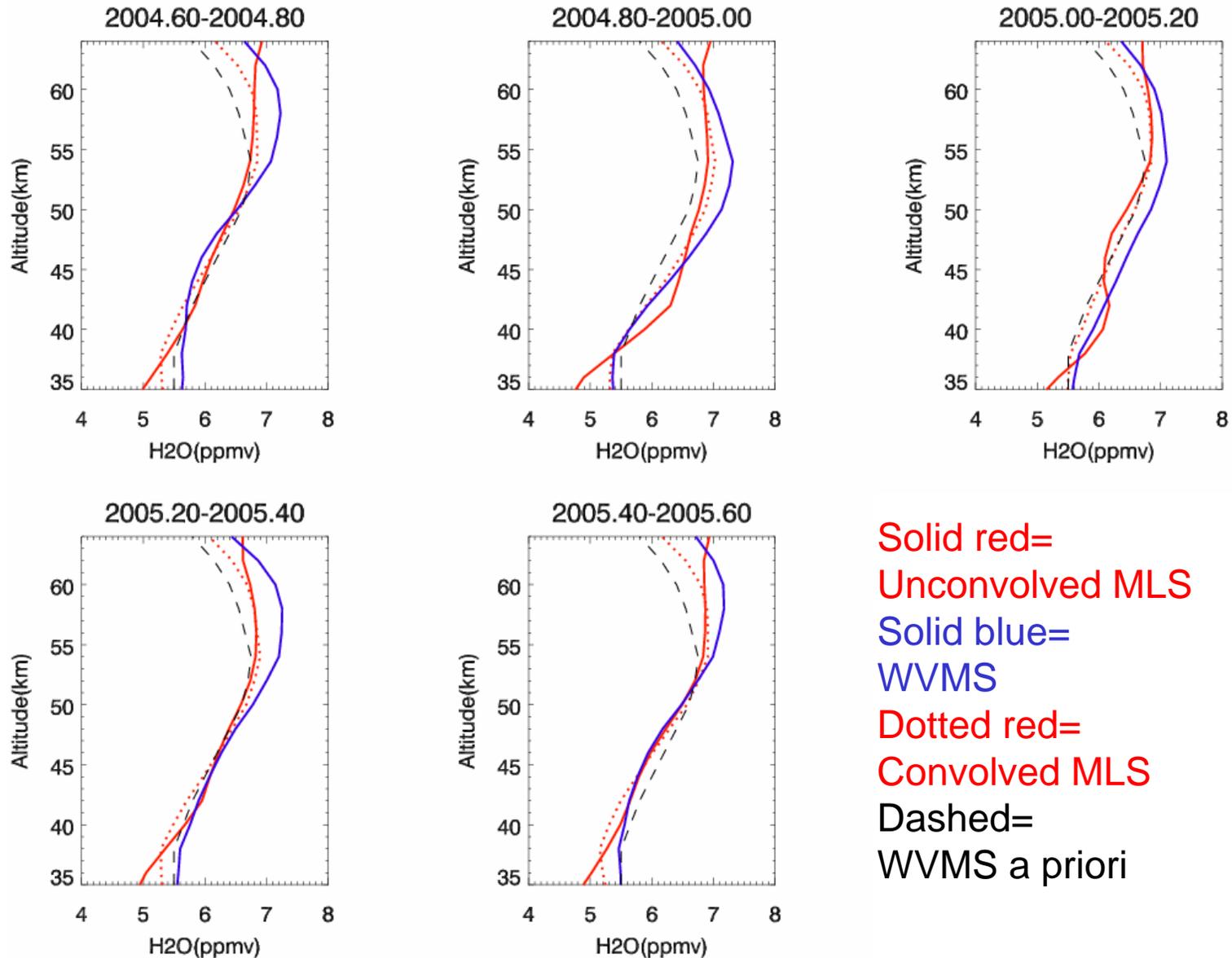
- Vertical resolution of MLS AURA water vapor is estimated to be:
 - 3 km in the upper troposphere and lower stratosphere
 - 4 km in most of the stratosphere
 - 6 km in the lower mesosphere
- Vertical resolution of POAM water vapor is estimated to be:
 - 1 km up to ~30 km
 - Degrading with altitude from 1 to 2 km from 30-40 km
- Vertical resolution of WVMS:

1 week integration
WVMS3, Mauna Loa



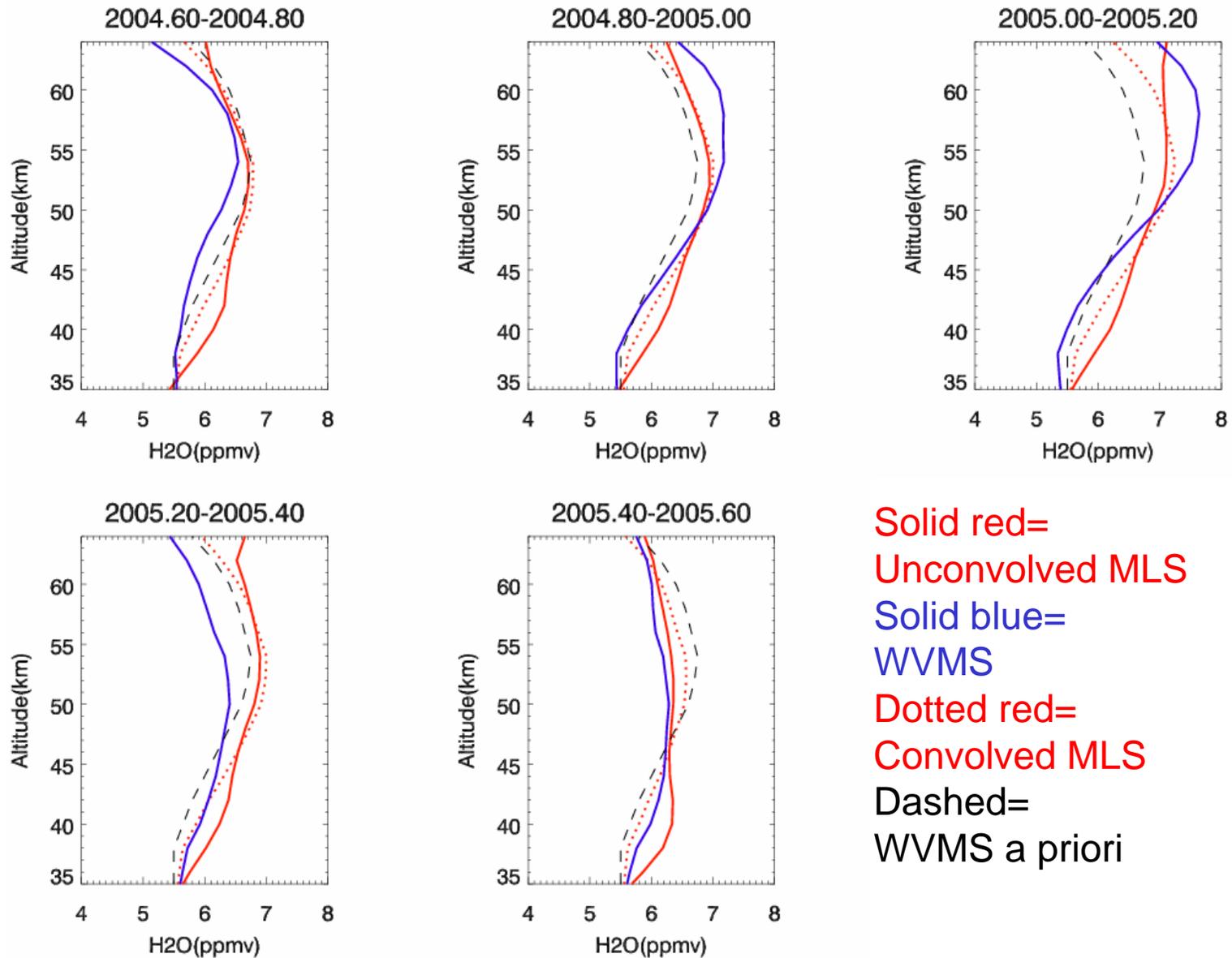
WVMS Mauna Loa (19.5N, 204.4E)

MLS +/-5 deg latitude and 8 deg longitude



WVMS Lauder (45.0S, 169.7E)

MLS +/-5 deg latitude and 8 deg longitude



MLS-WVMS comparisons

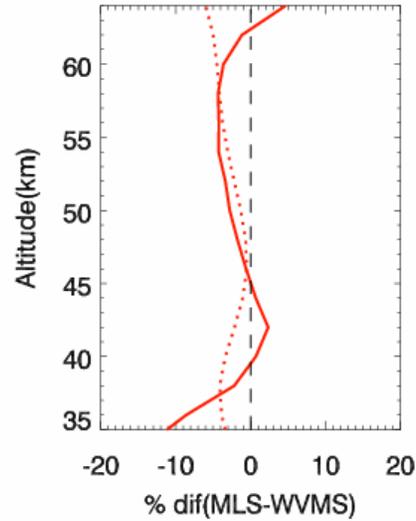
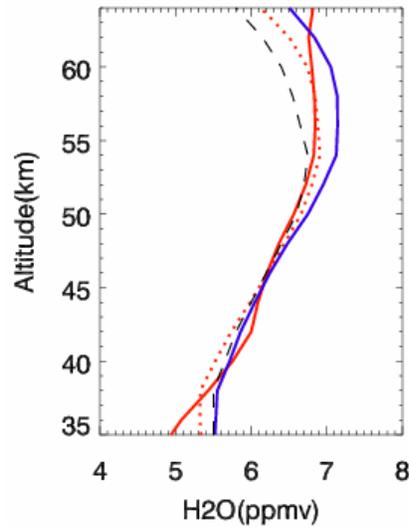
Year-long averages

Solid red=
Unconvolved MLS

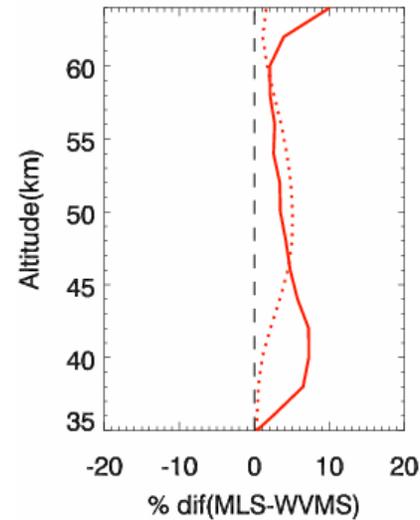
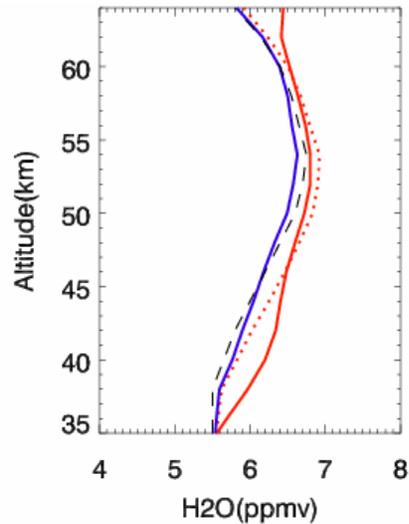
Dotted red=
Convolved MLS

Solid blue=
WVMS

Dashed=
WVMS a priori



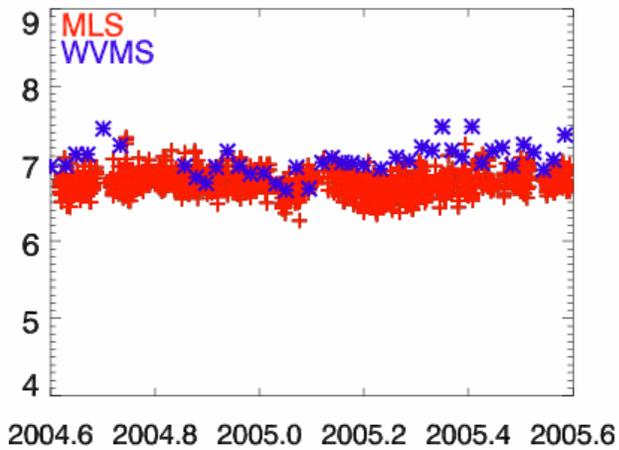
Mauna Loa
(19.5N, 204.4E)



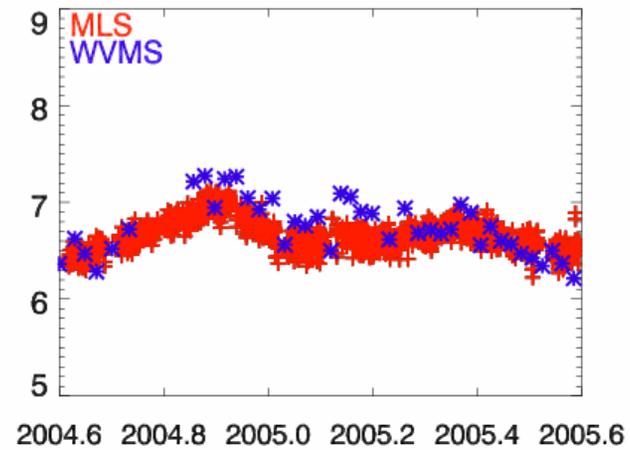
Lauder (45S, 169.7E)

WVMS-MLS (convolved) comparisons

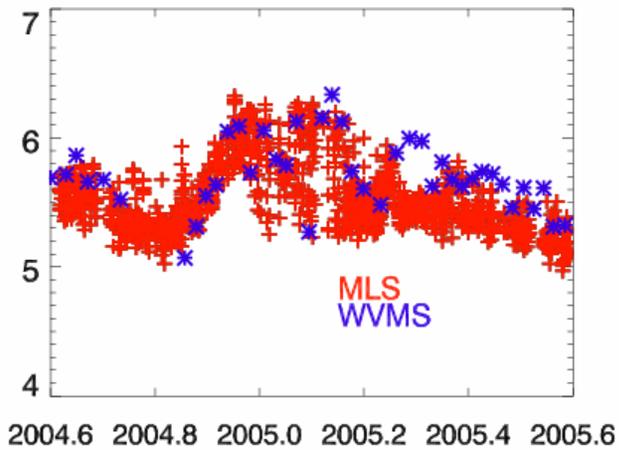
Mauna Loa; 60 km



Mauna Loa; 50 km

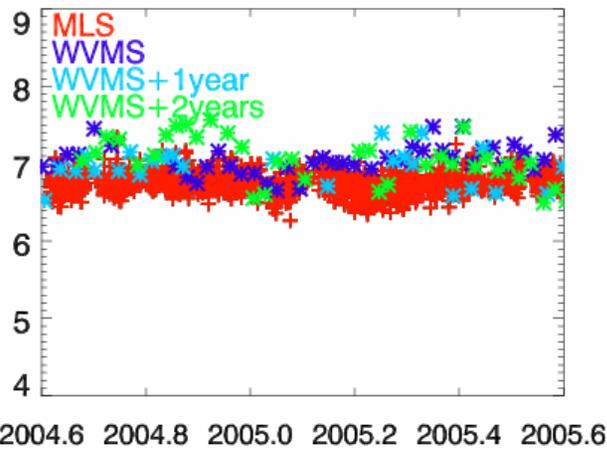


Mauna Loa; 40 km

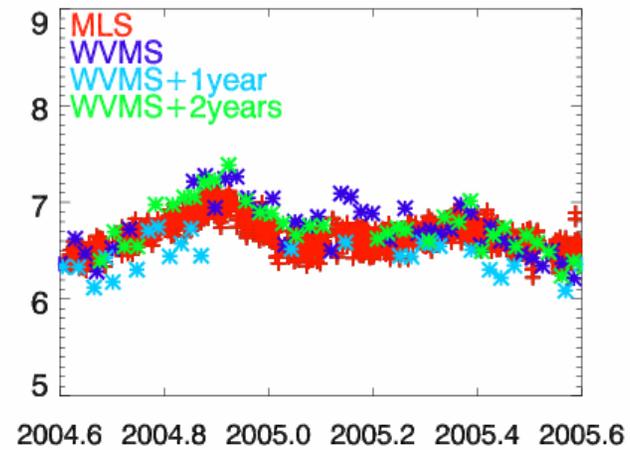


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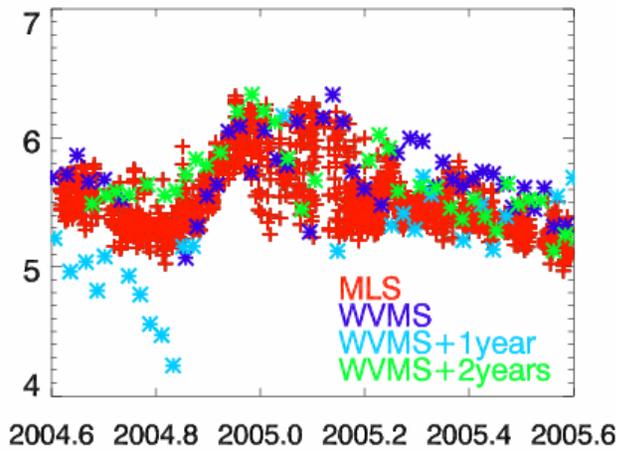
Mauna Loa; 60 km



Mauna Loa; 50 km

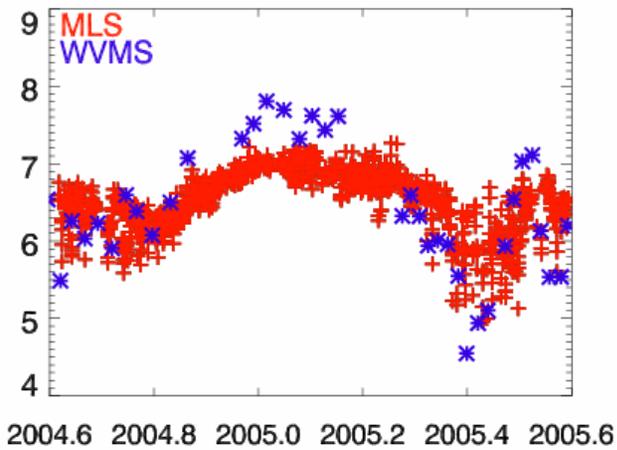


Mauna Loa; 40 km

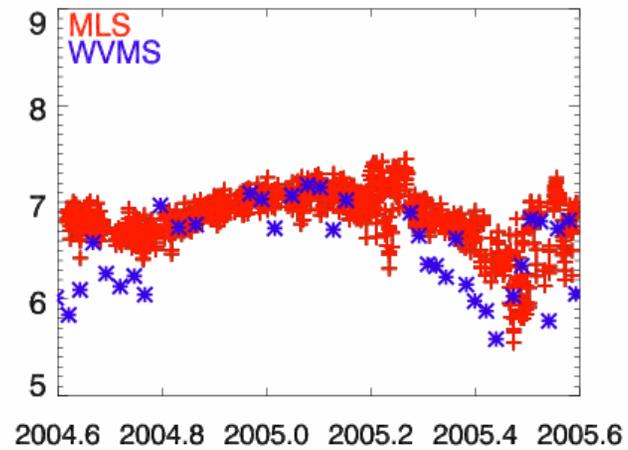


WVMS-MLS (convolved) comparisons

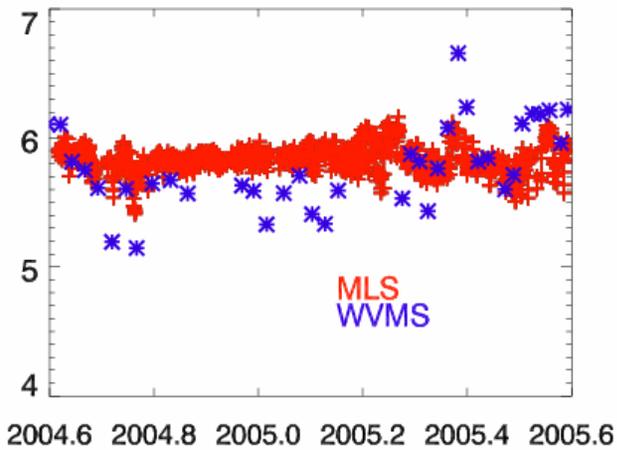
Lauder; 60 km



Lauder; 50 km

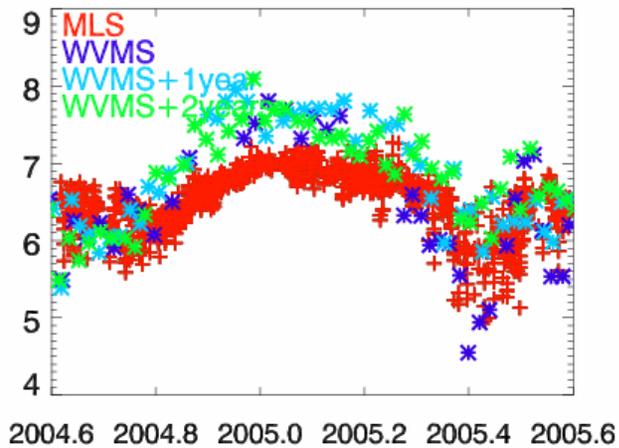


Lauder; 40 km

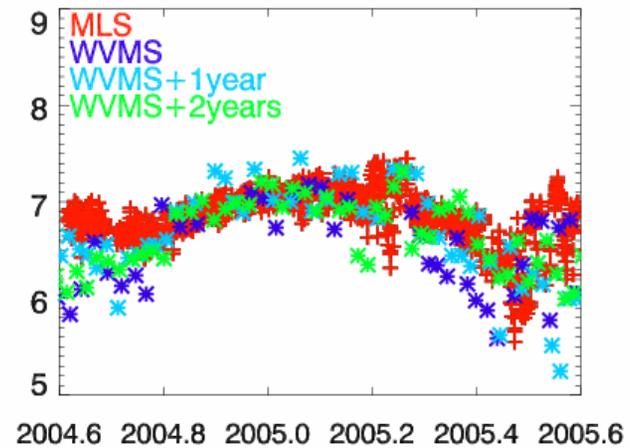


WVMS-MLS (convolved) comparisons

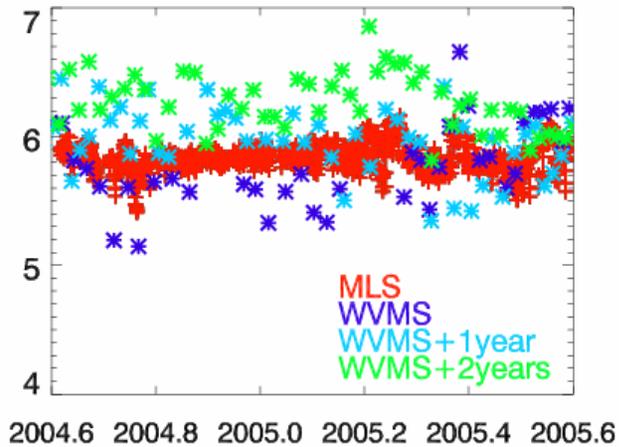
Lauder; 60 km



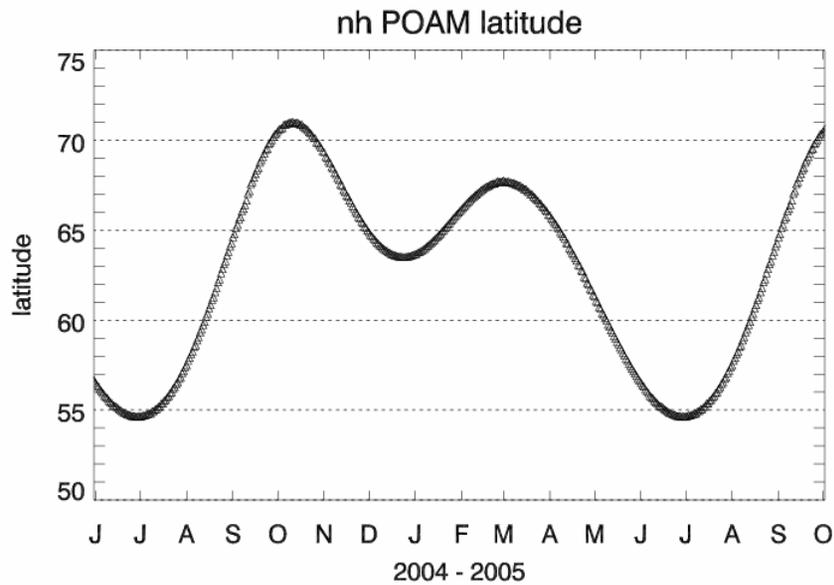
Lauder; 50 km



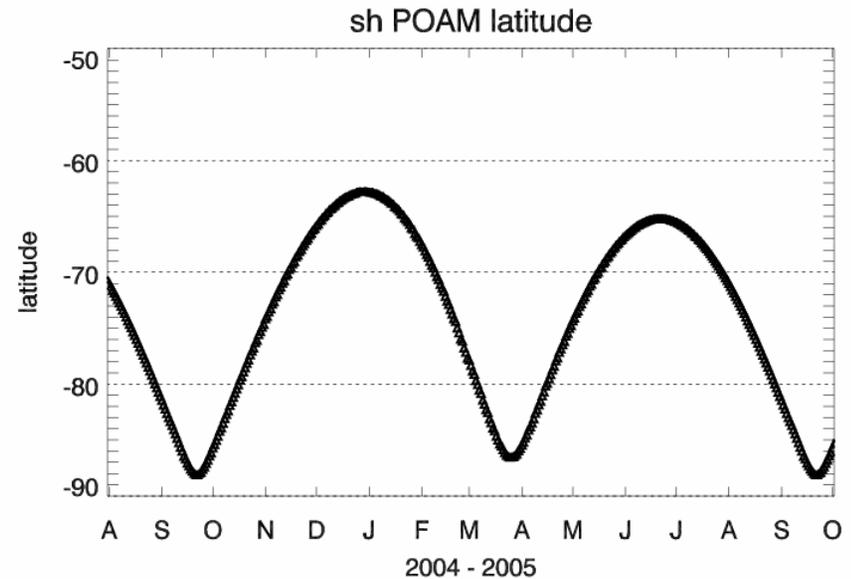
Lauder; 40 km



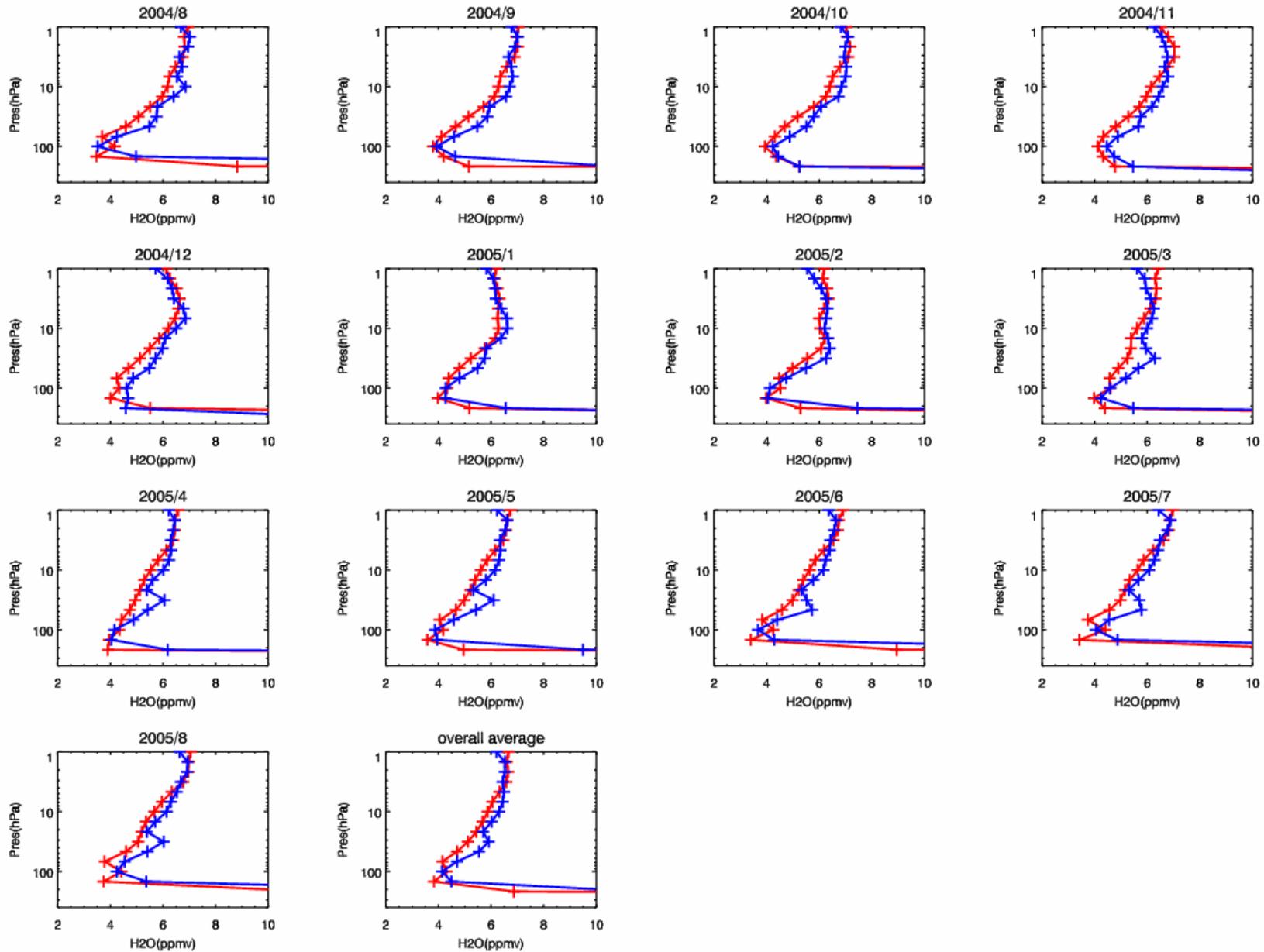
POAM-MLS comparisons



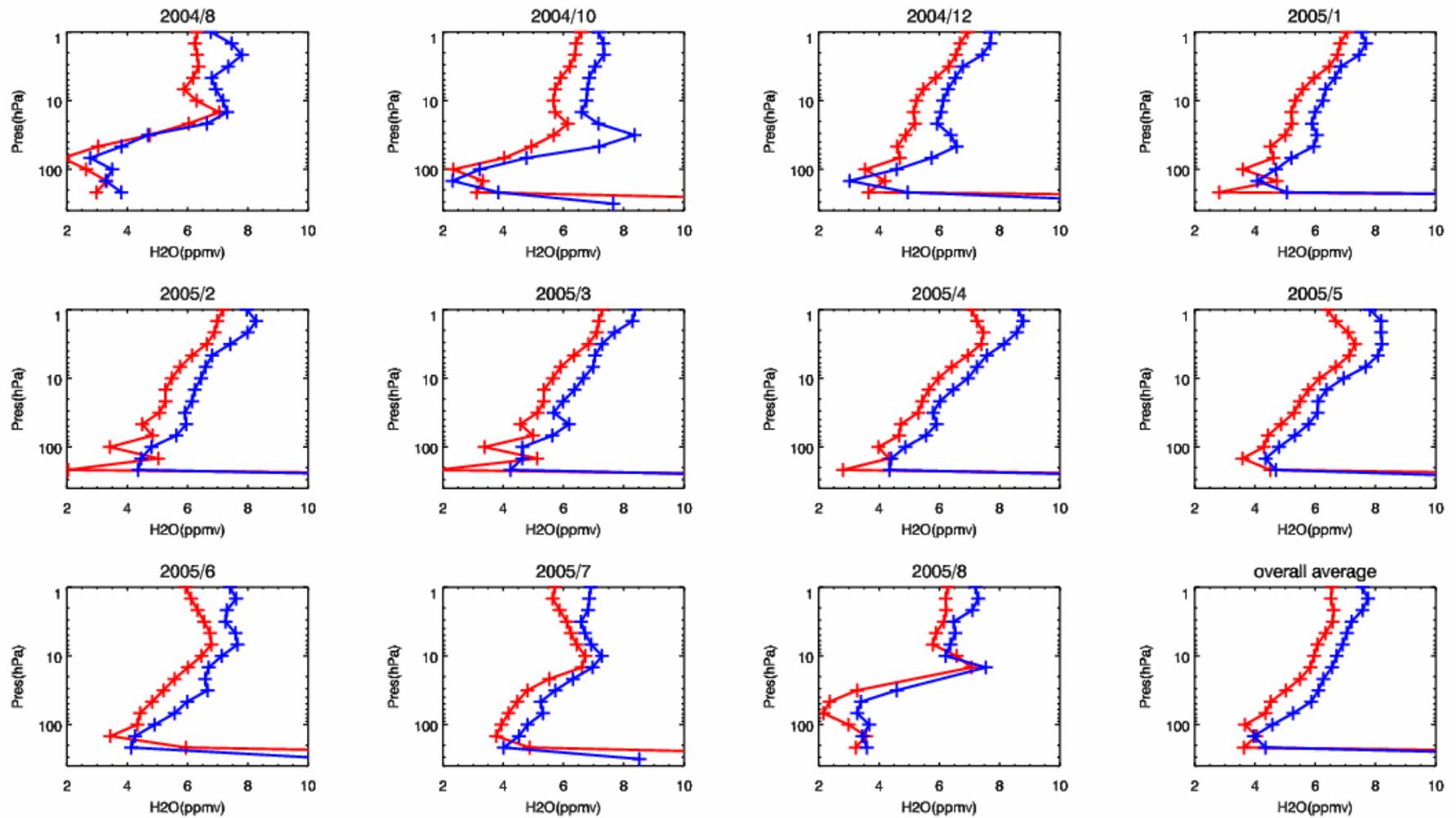
Choose MLS profiles within
 ± 2 degrees latitude



POAM-MLS comparisons: Northern Hemisphere

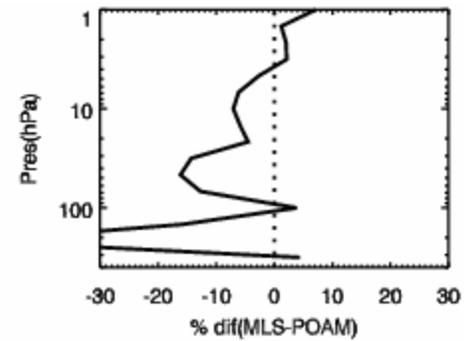
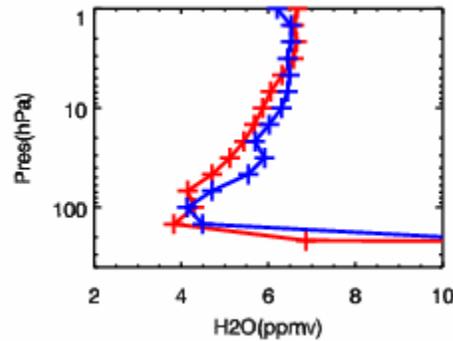


POAM-MLS comparisons: Southern Hemisphere

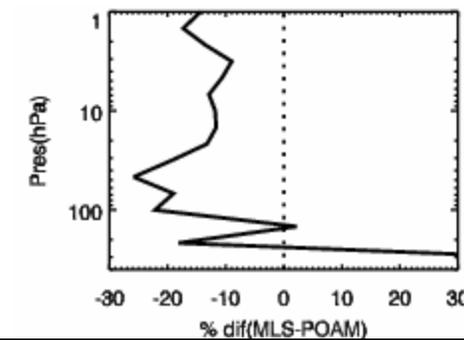
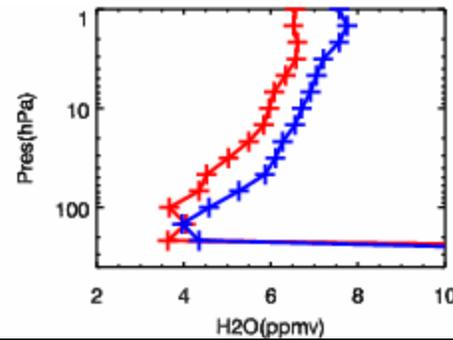


MLS-POAM comparisons: Year-long averages

Northern Hemisphere

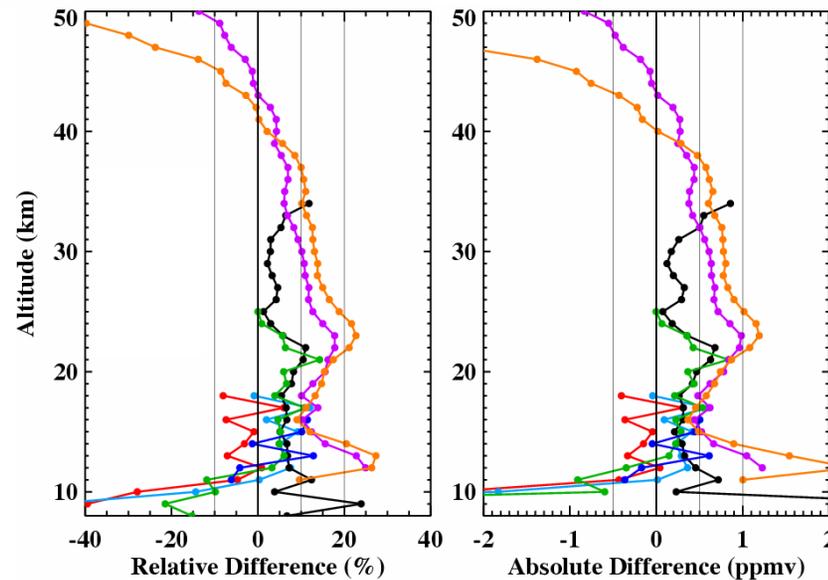


Southern Hemisphere



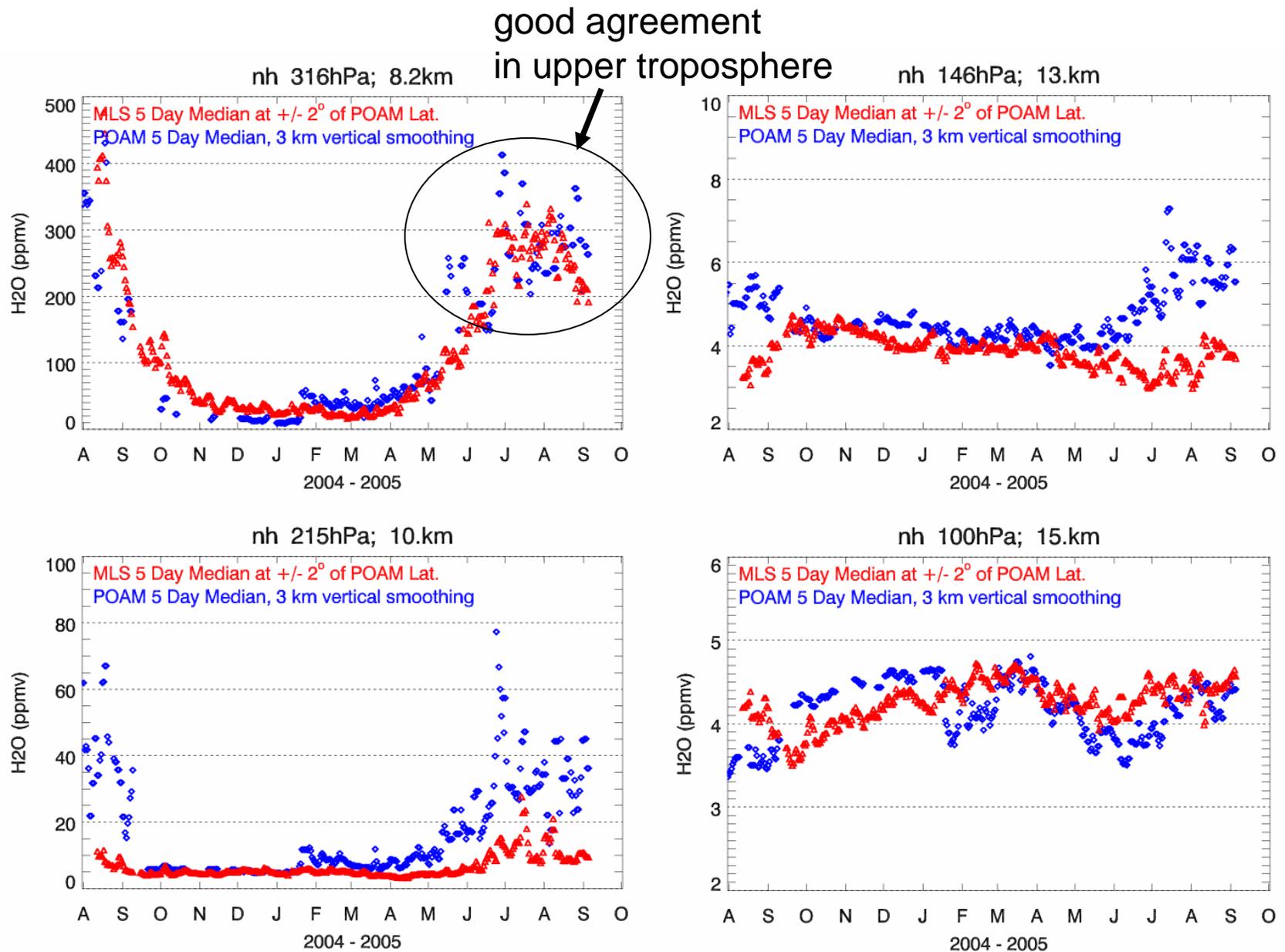
POAM-

- HALOE
- SAGE II
- MkIV
- CMDL
- FISH
- ER-2/JPL
- ER-2/HU



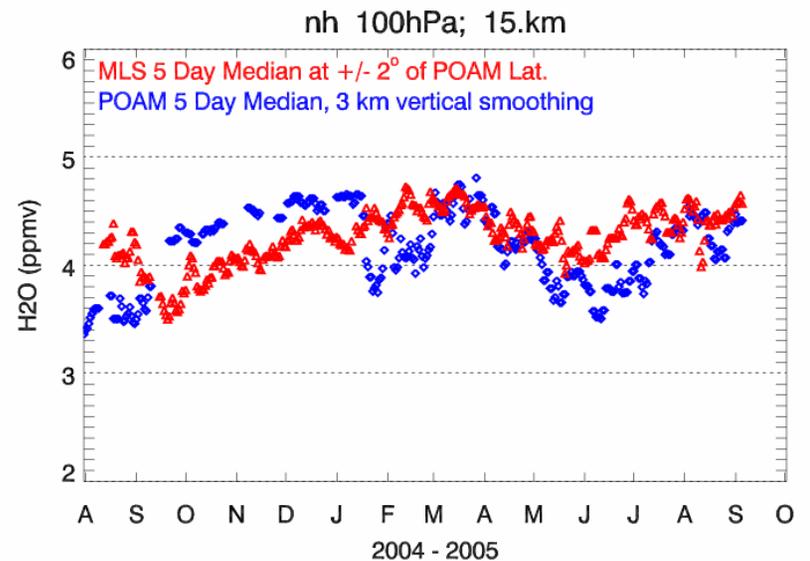
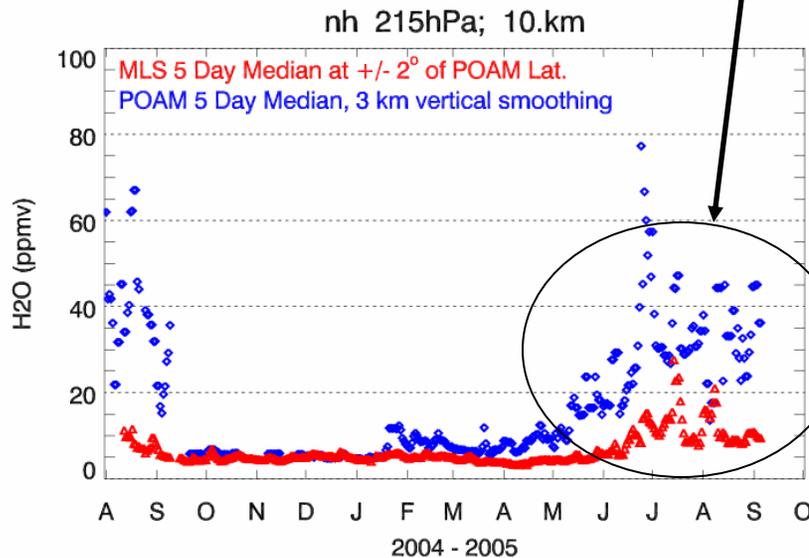
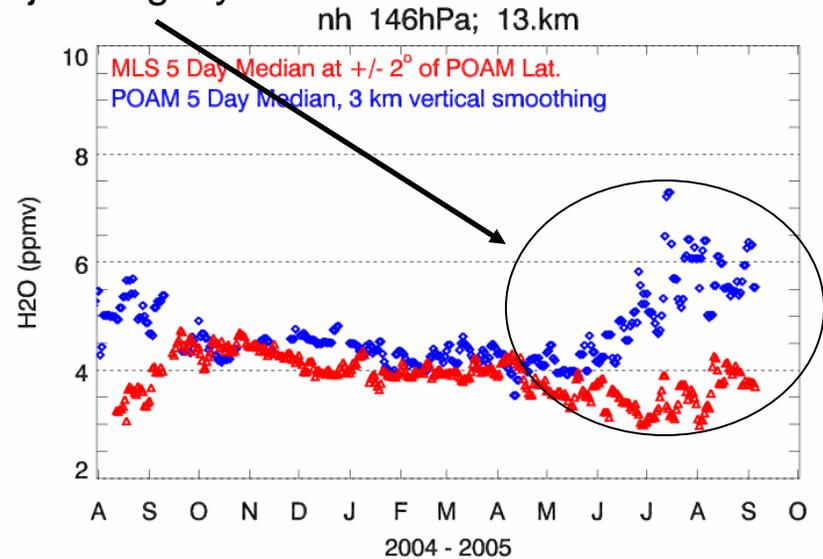
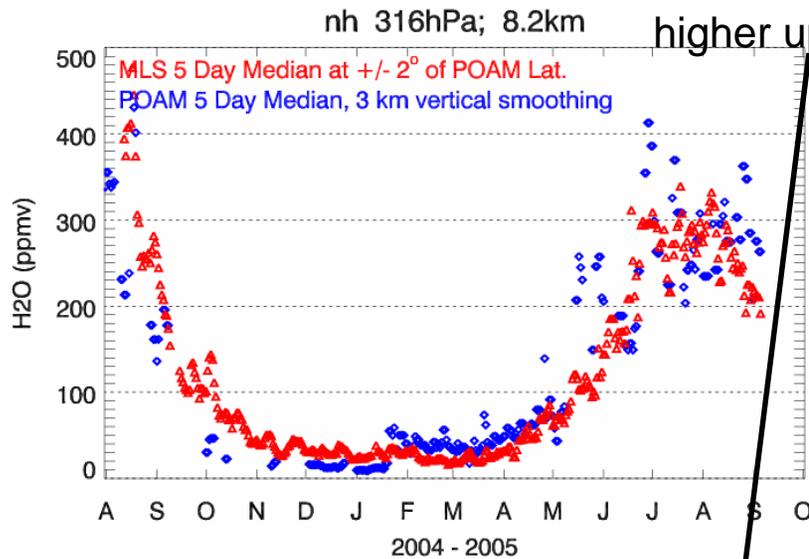
POAM coincidences during SOLVE II + long-term differences with SAGE and HALOE

POAM-MLS comparisons: Northern Hemisphere

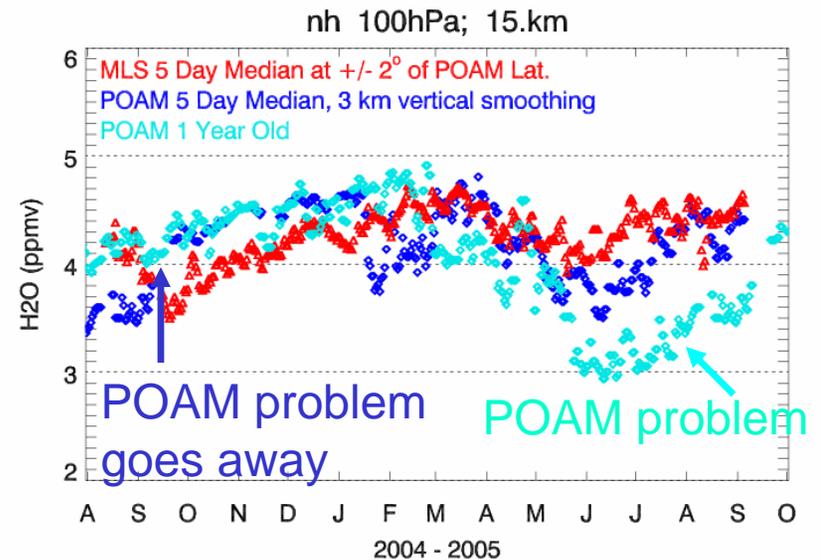
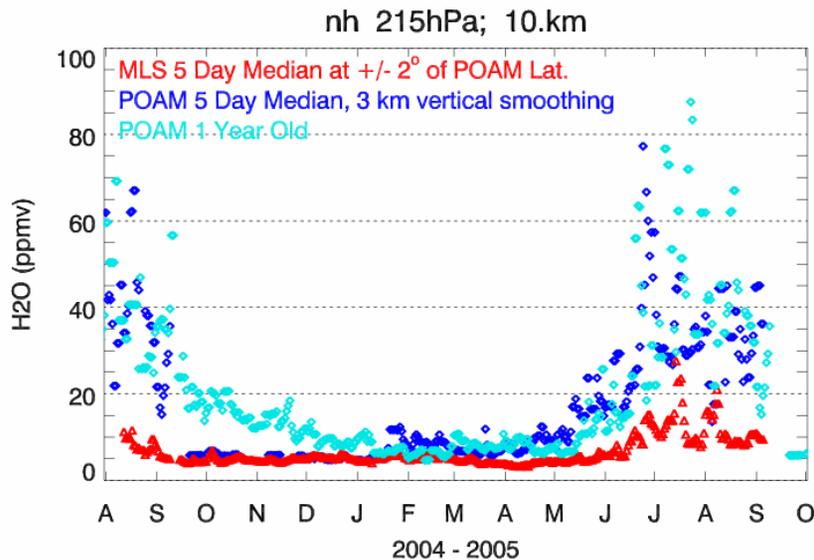
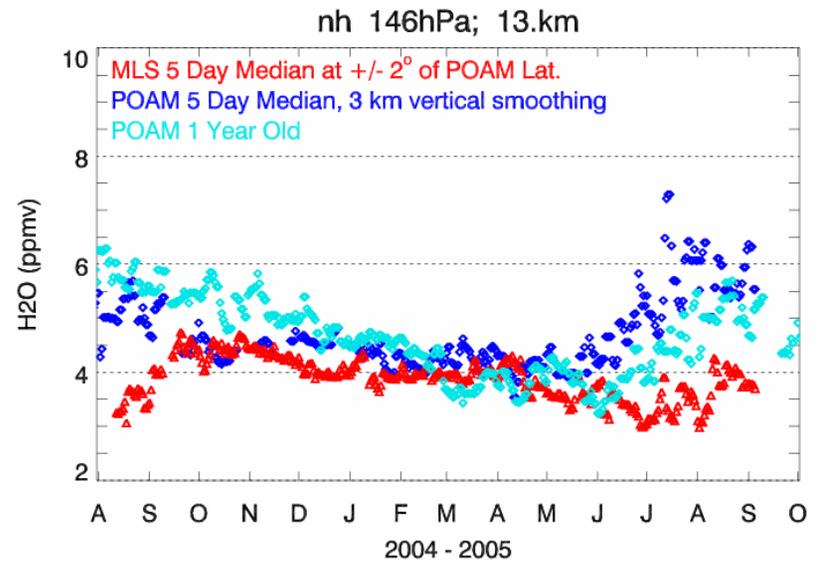
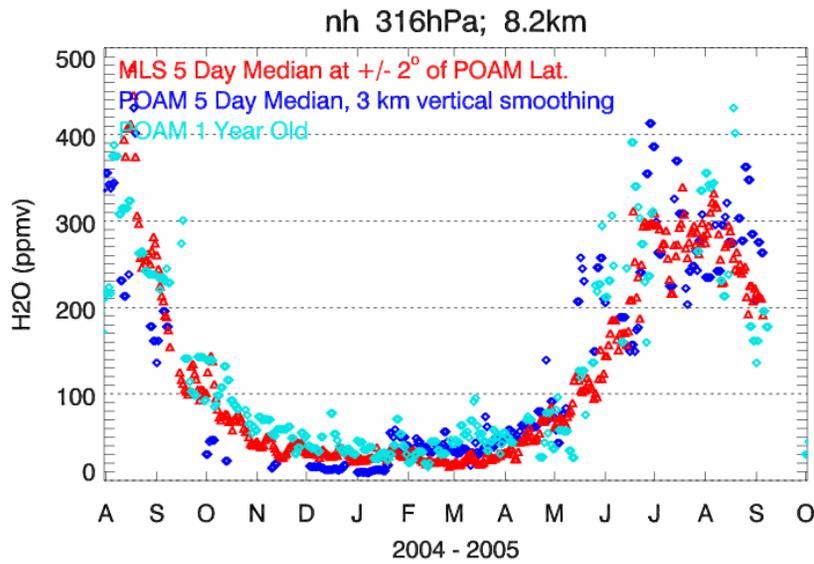


POAM-MLS comparisons: Northern Hemisphere

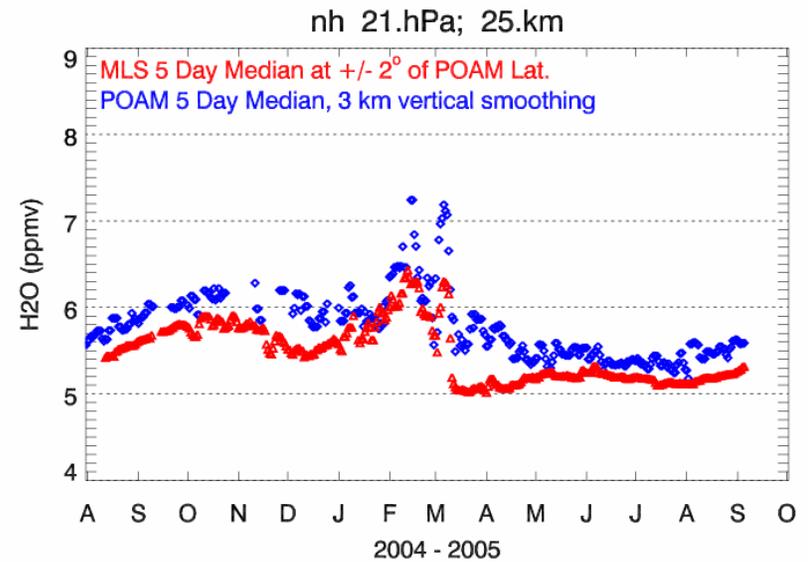
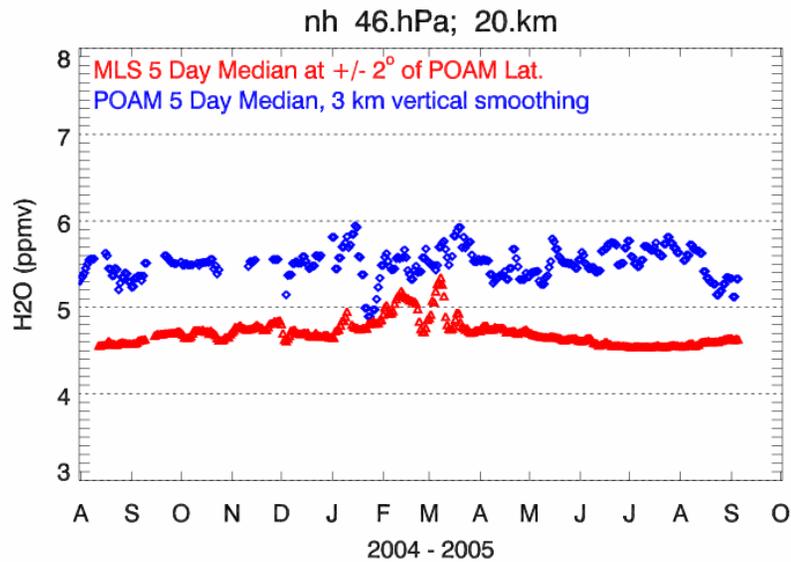
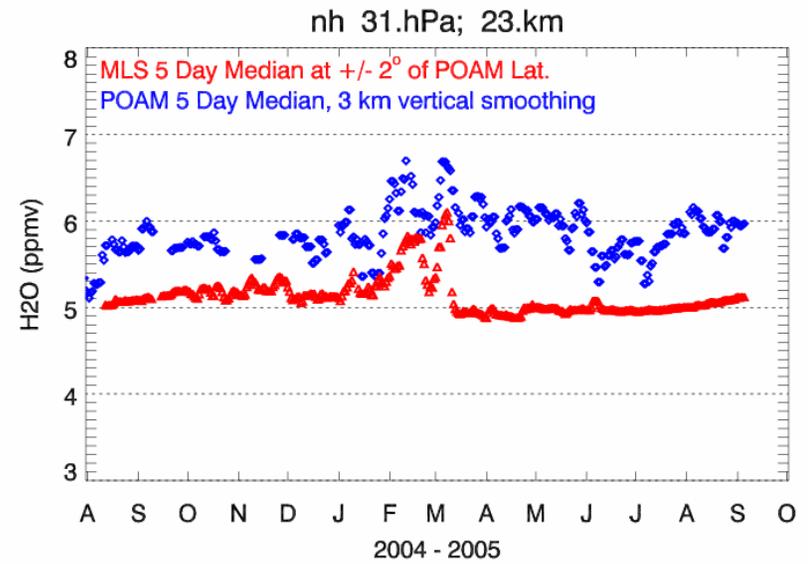
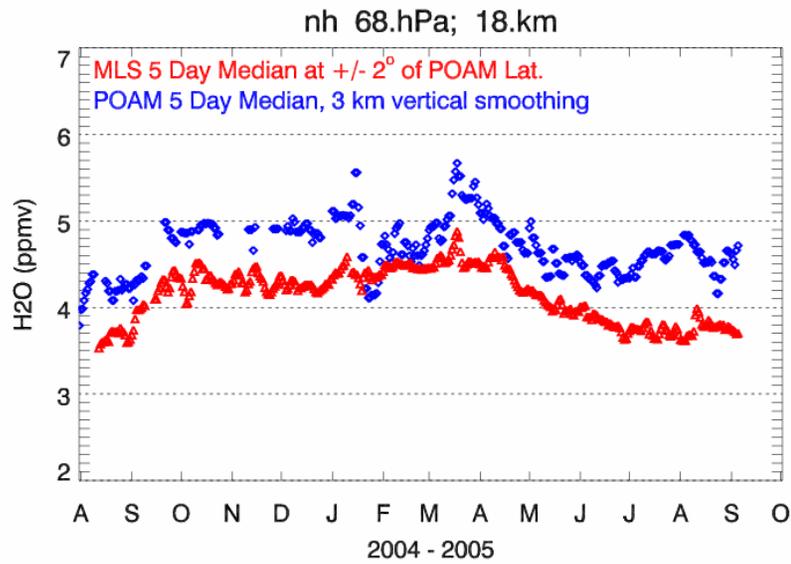
But big summertime differences just slightly higher up



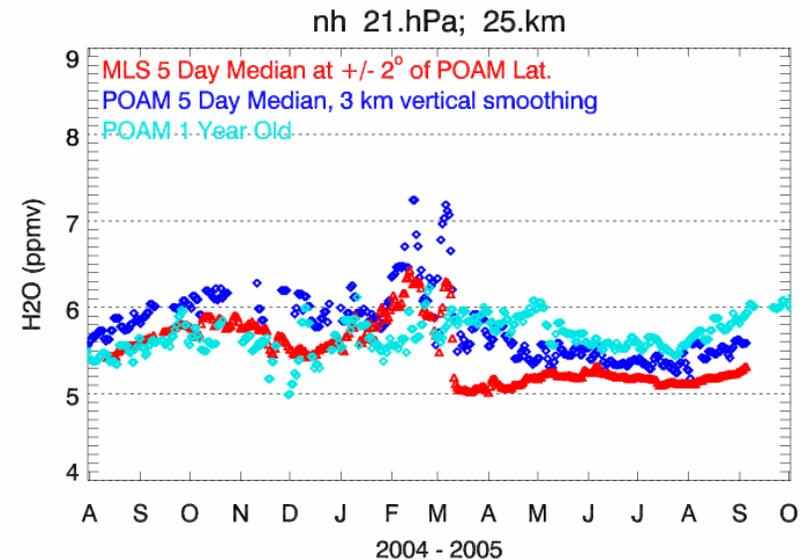
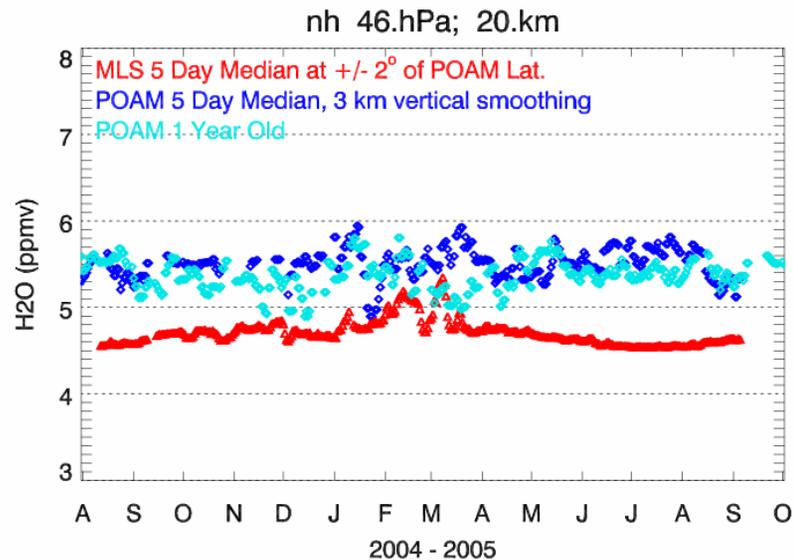
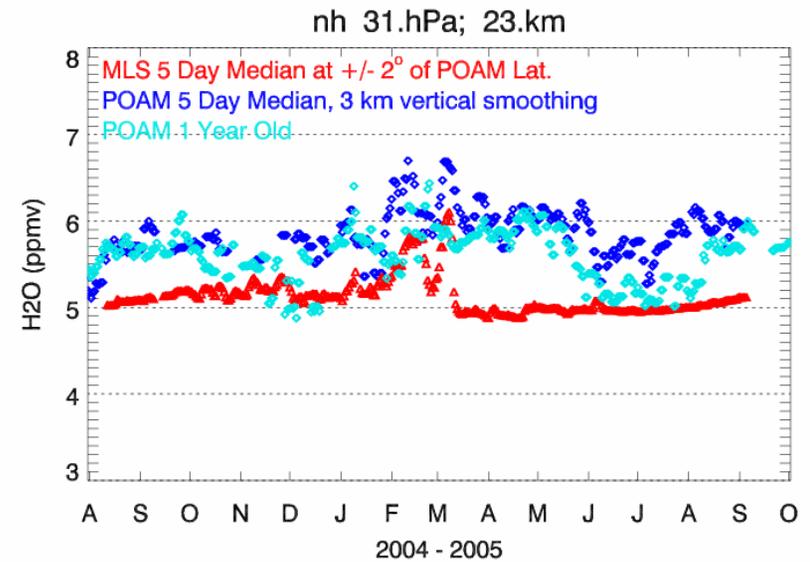
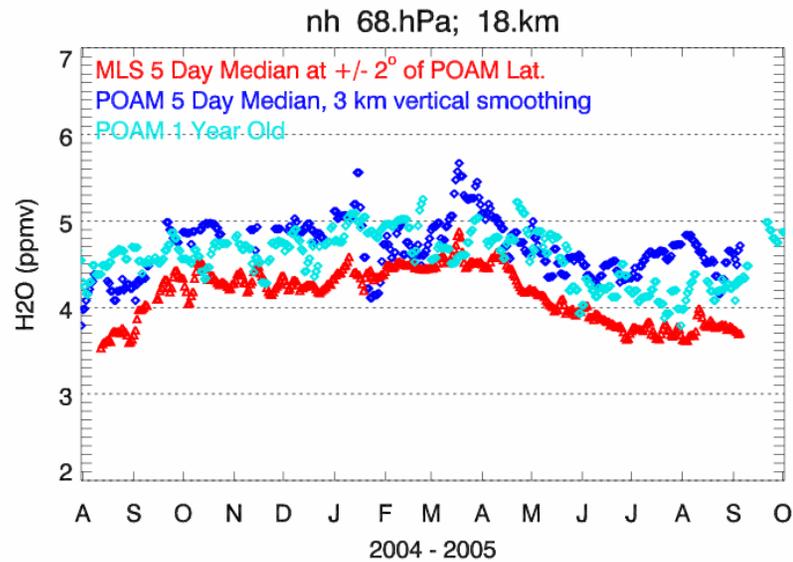
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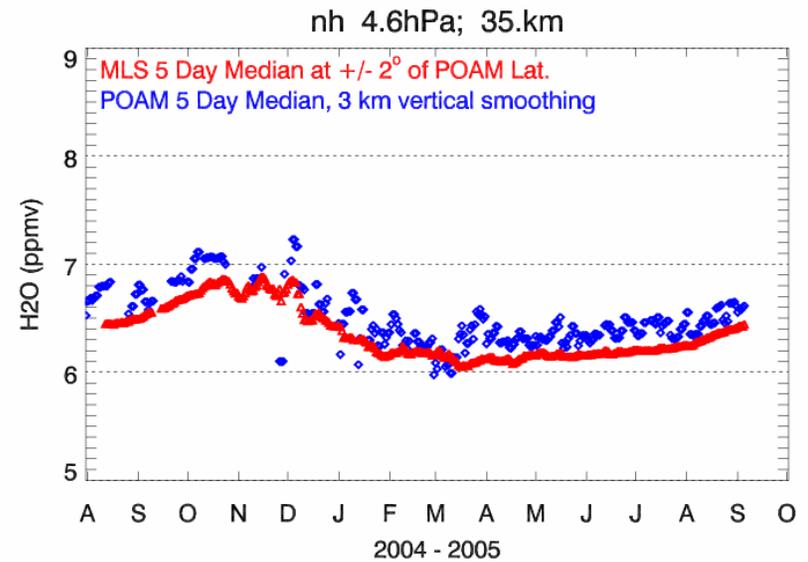
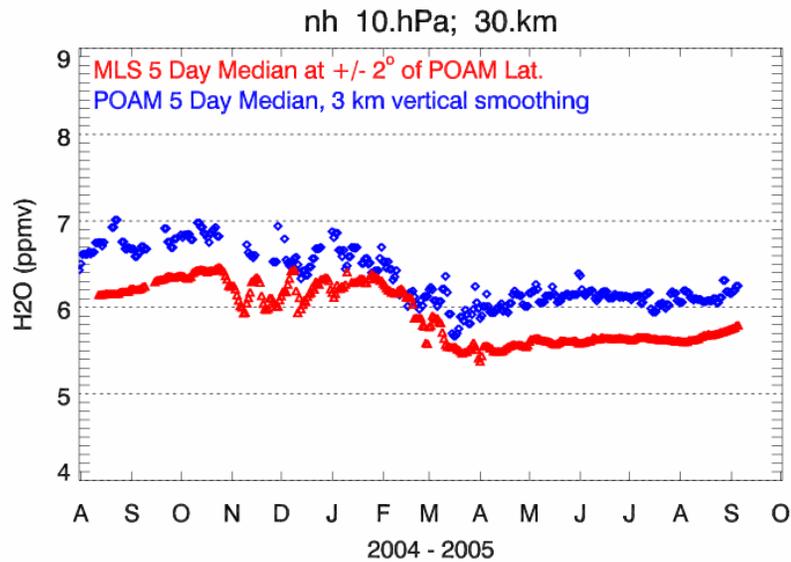
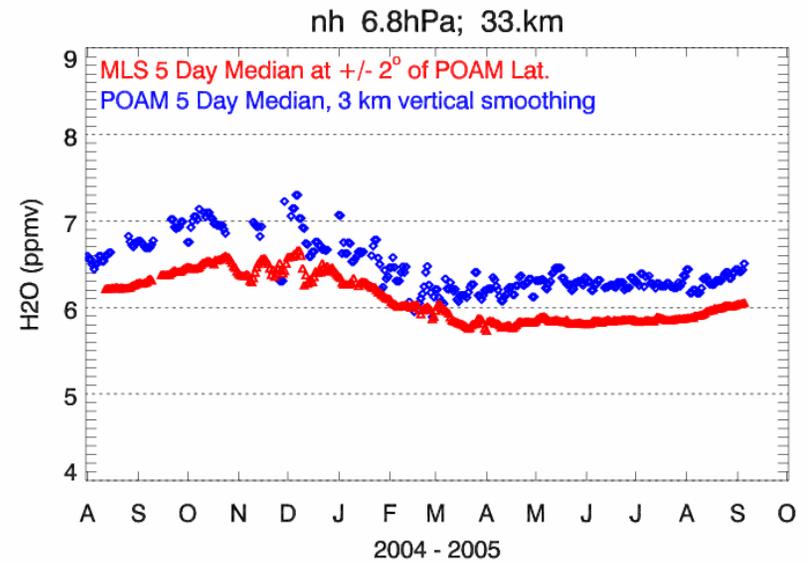
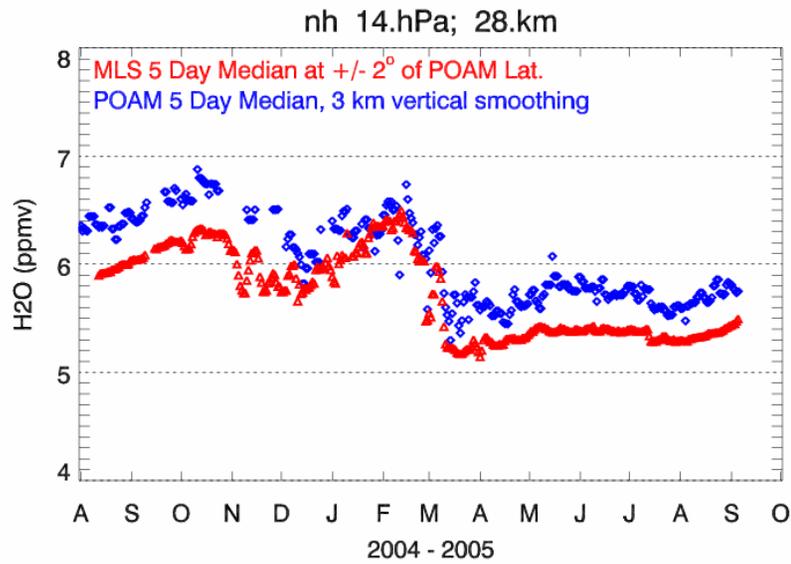
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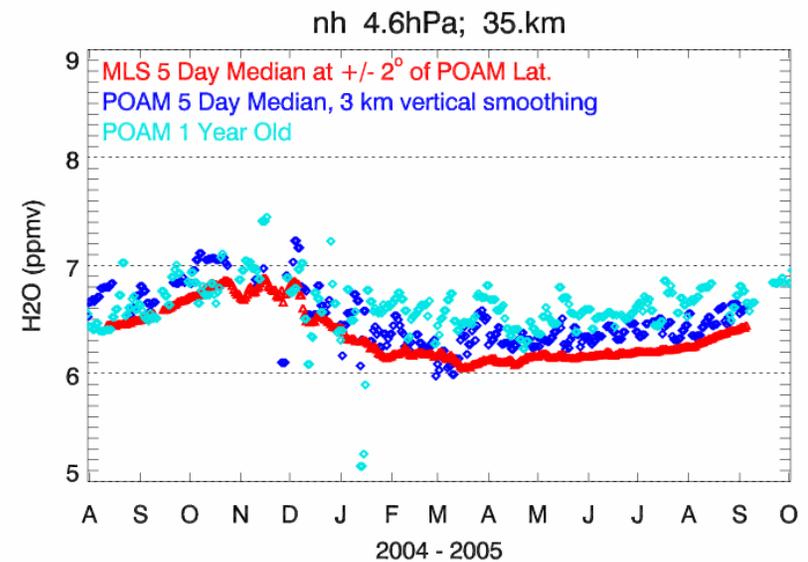
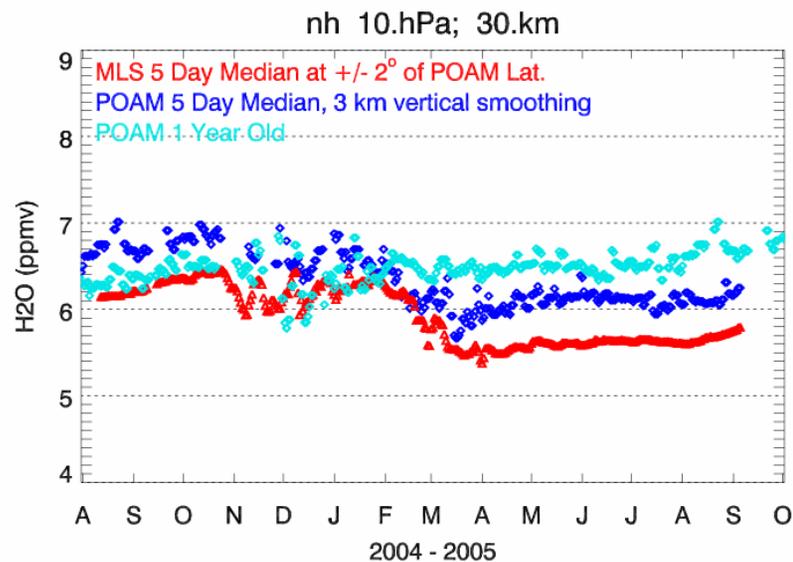
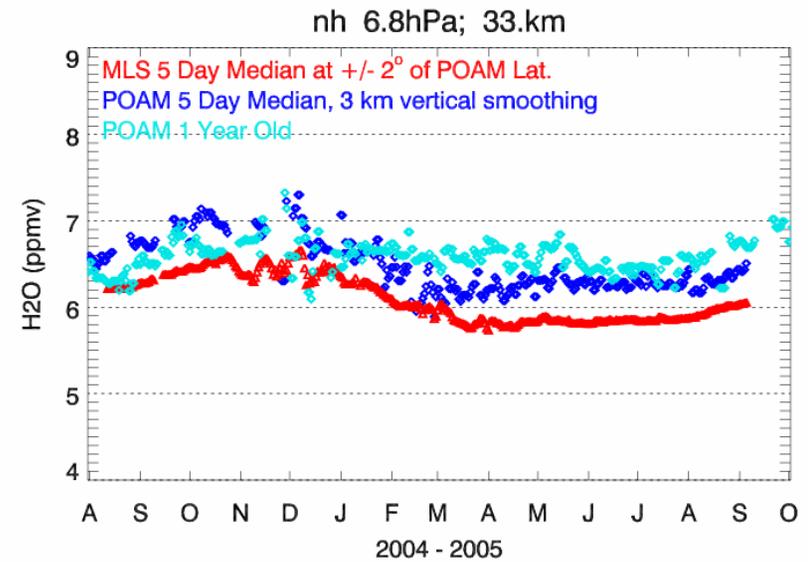
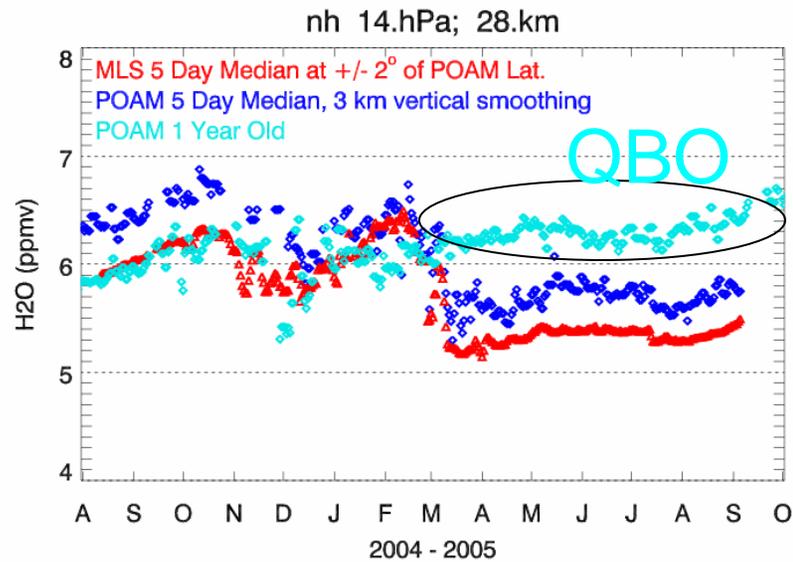
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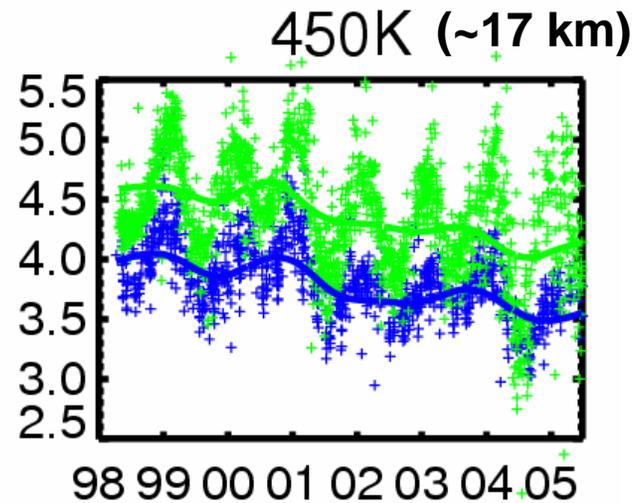
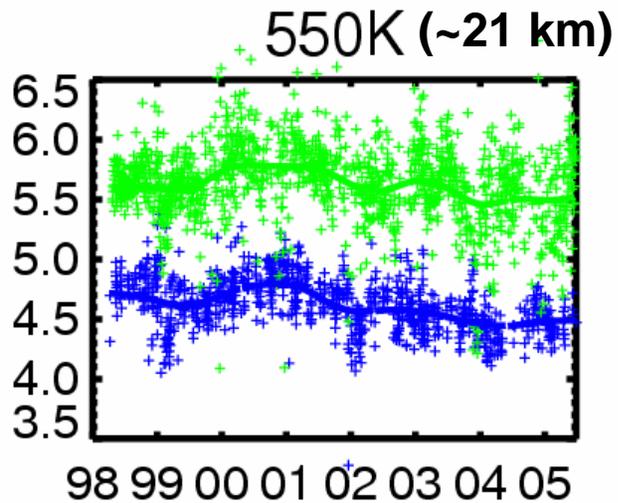
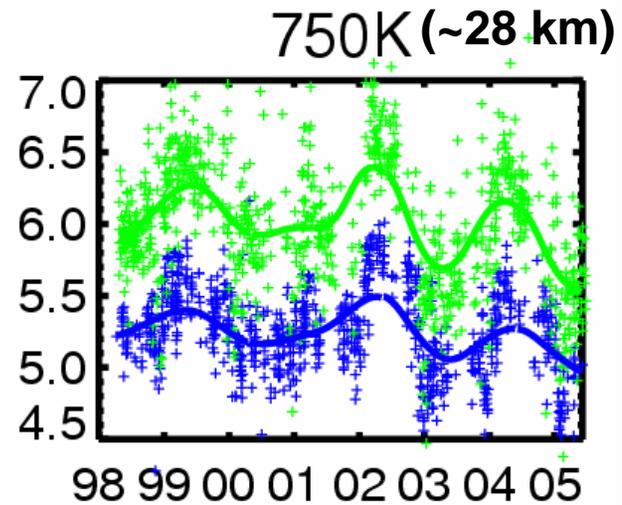
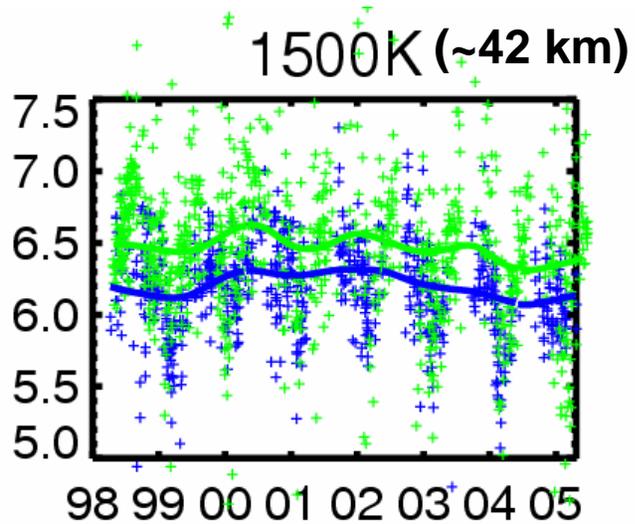
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POAM-MLS comparisons: Northern Hemisphere

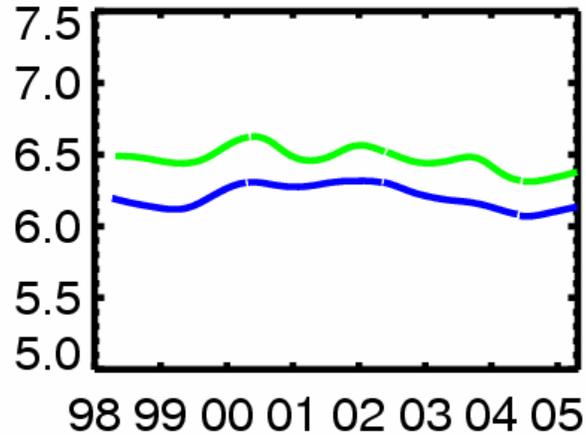


HALOE and POAM; 45N-55N Equivalent Latitude

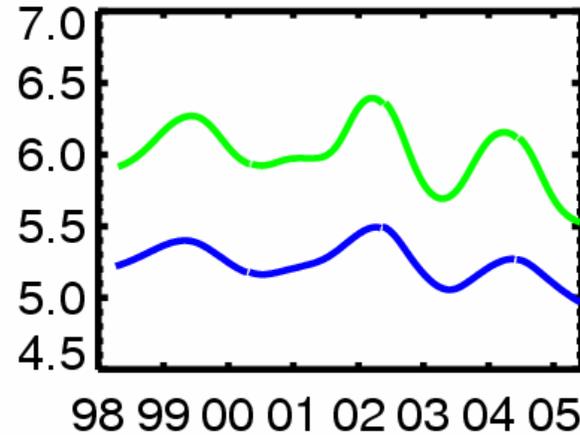


HALOE and POAM; 45N-55N Equivalent Latitude

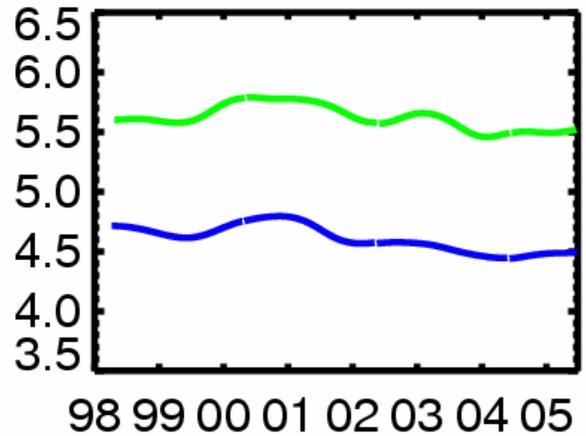
1500K (~42 km)



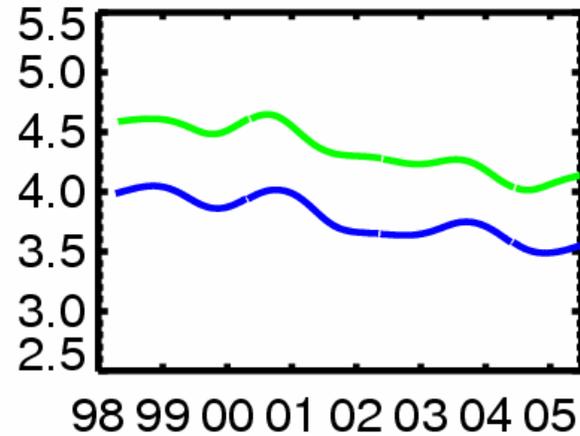
750K (~28 km)



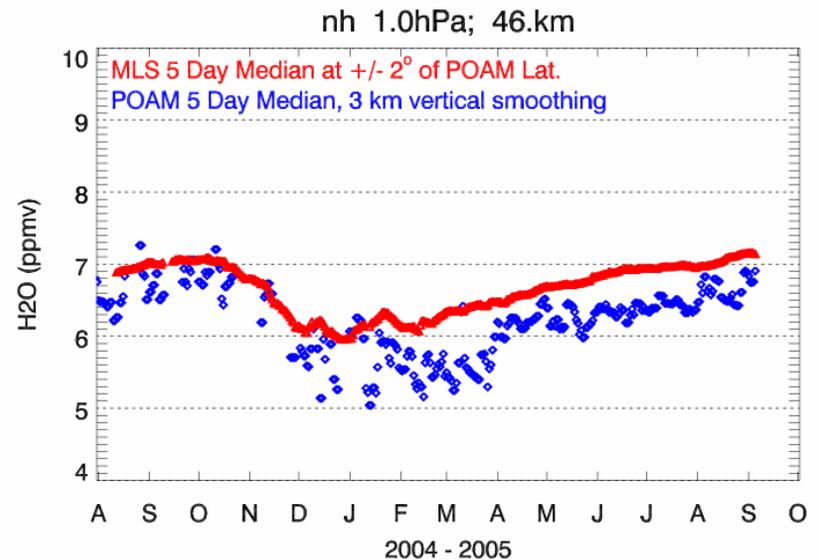
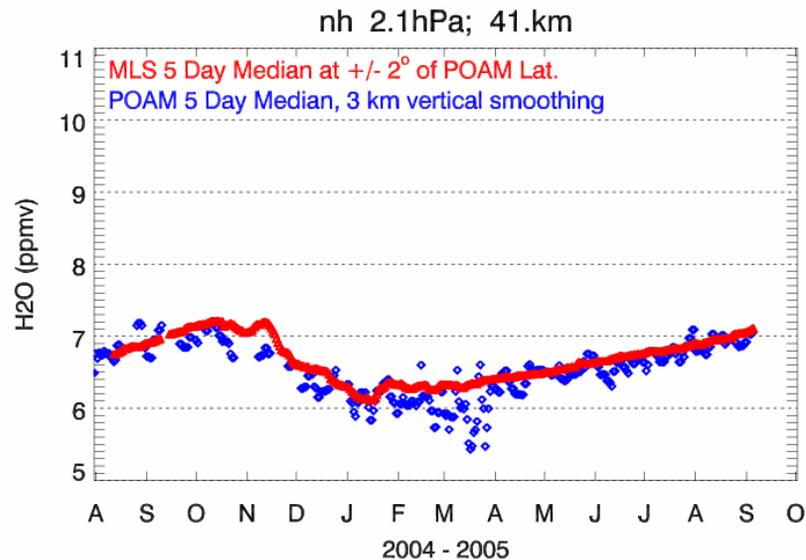
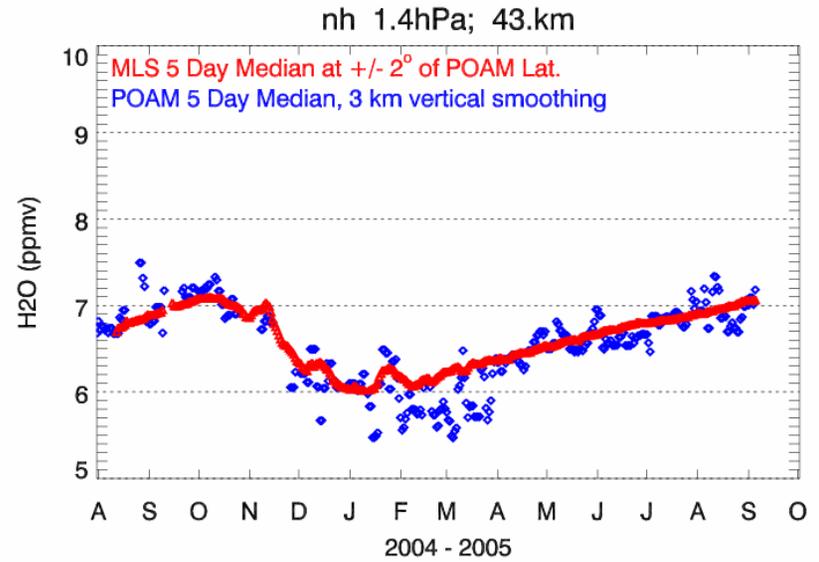
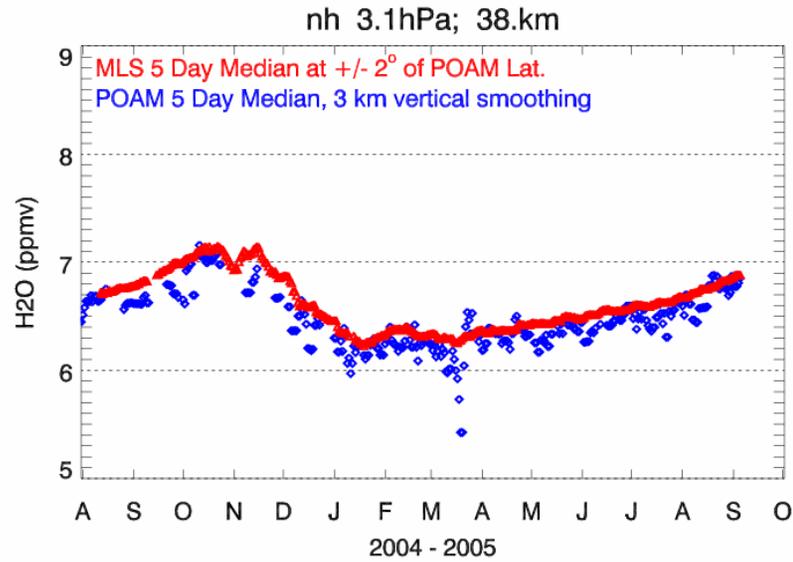
550K (~21 km)



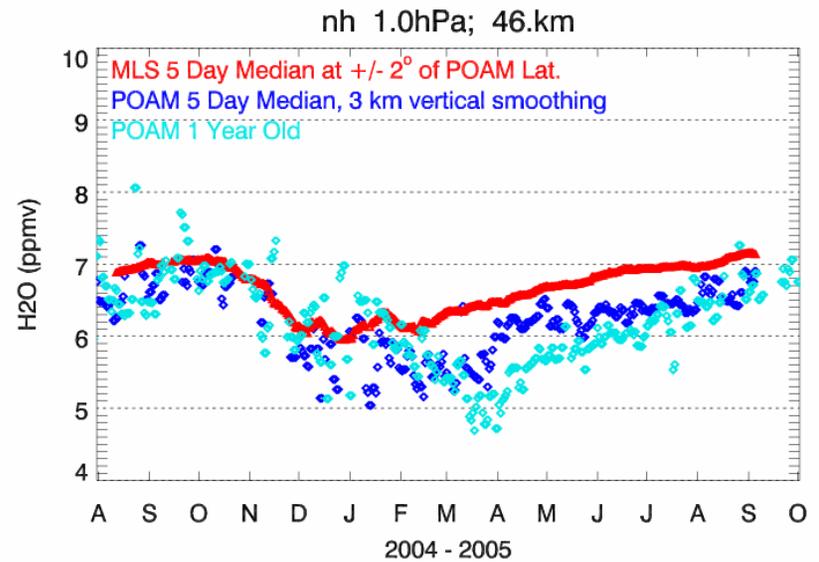
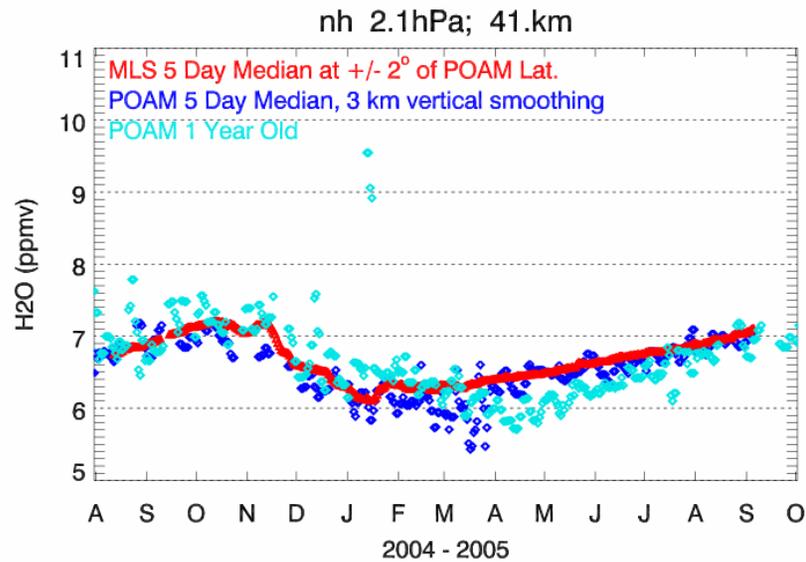
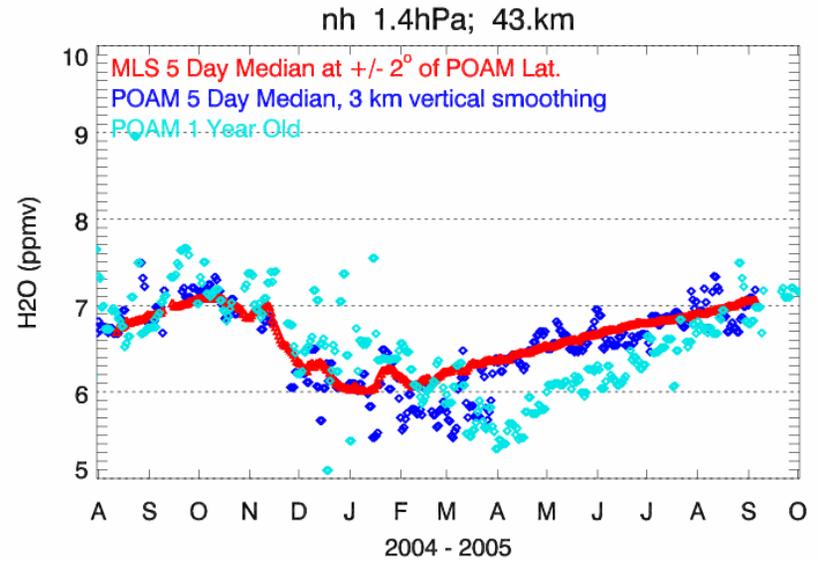
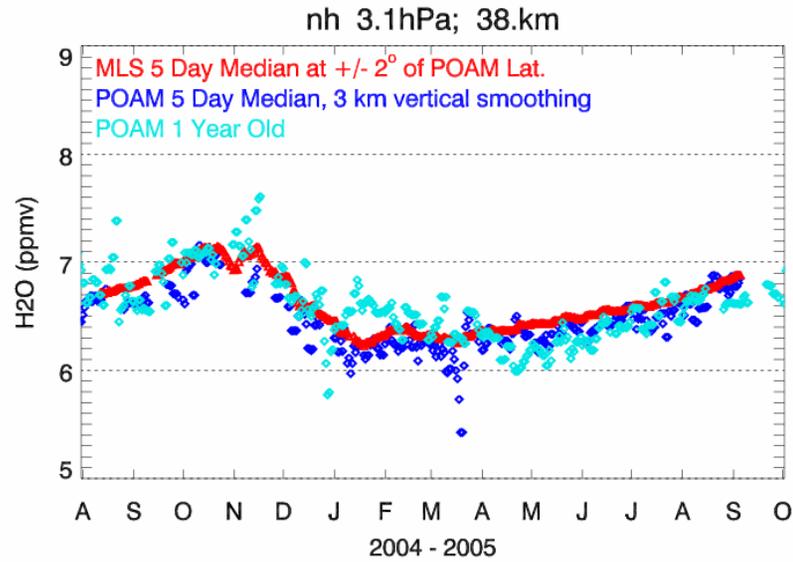
450K (~17 km)



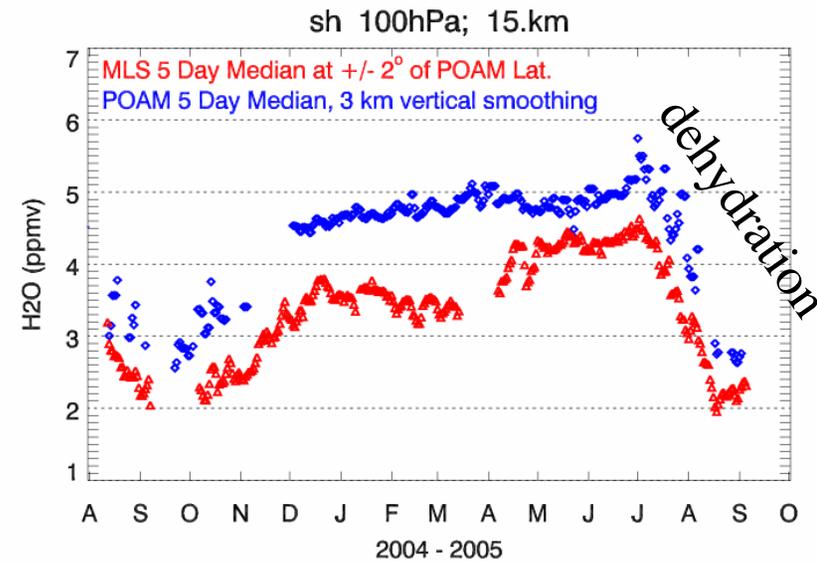
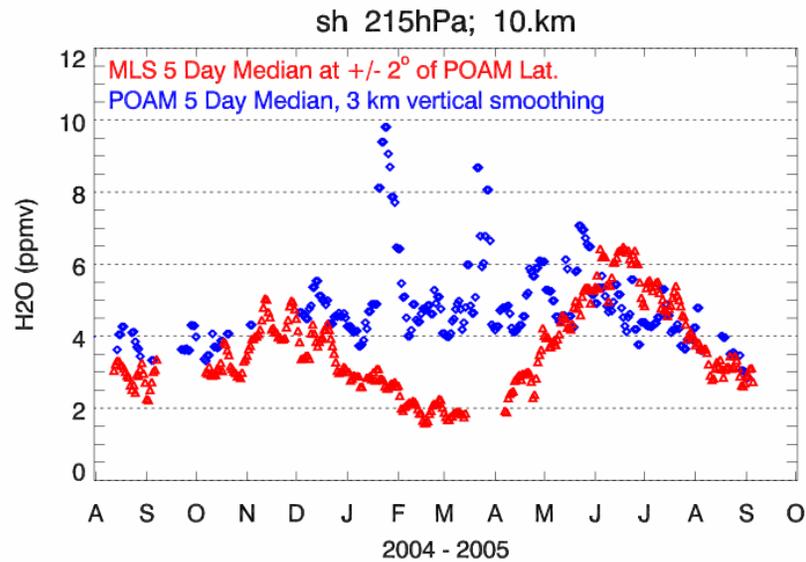
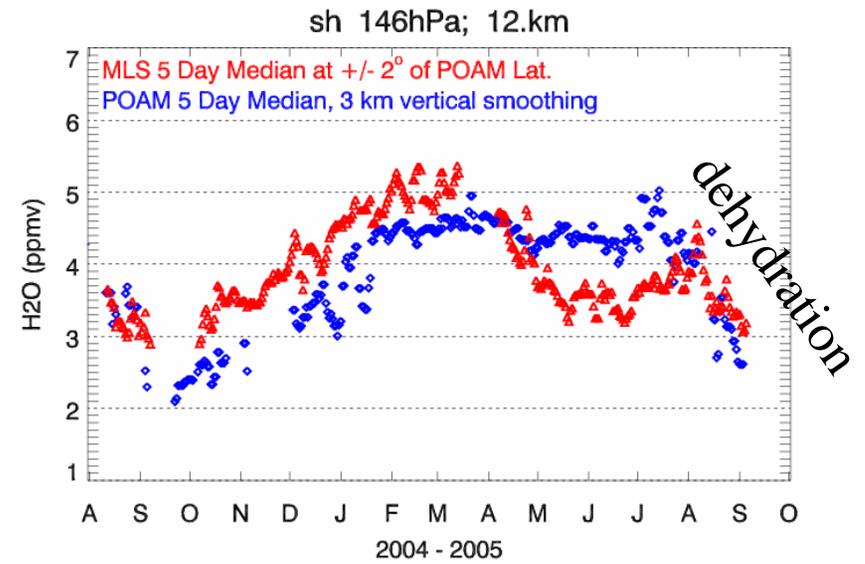
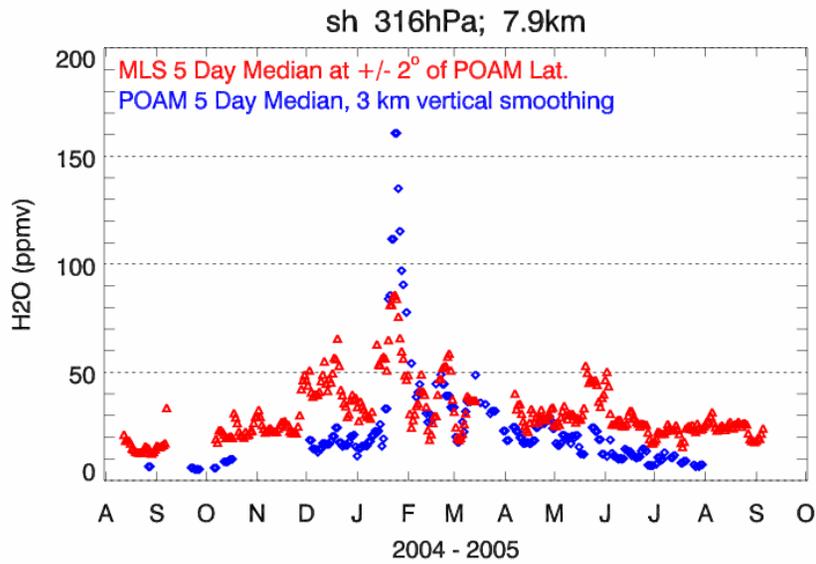
POAM-MLS comparisons: Northern Hemisphere



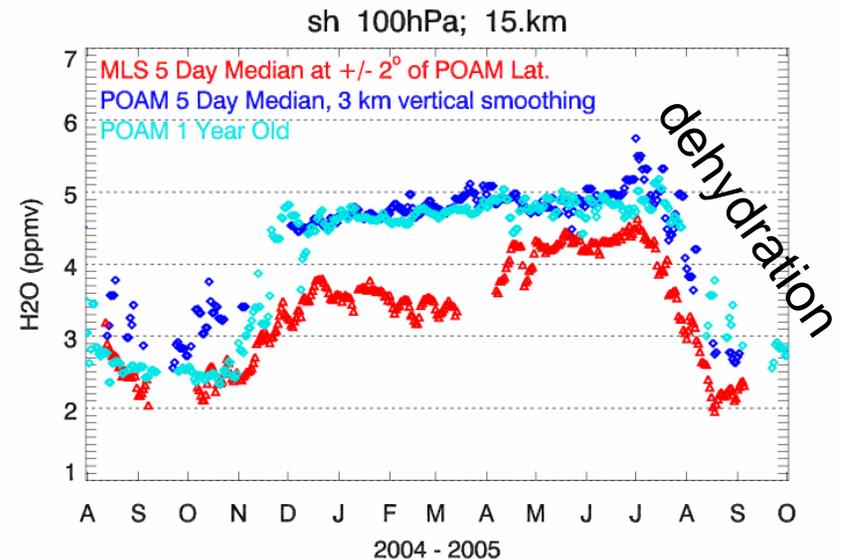
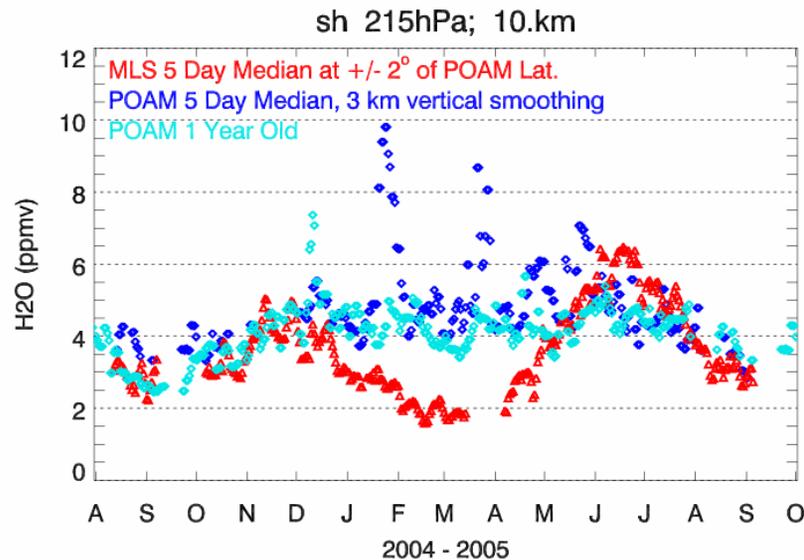
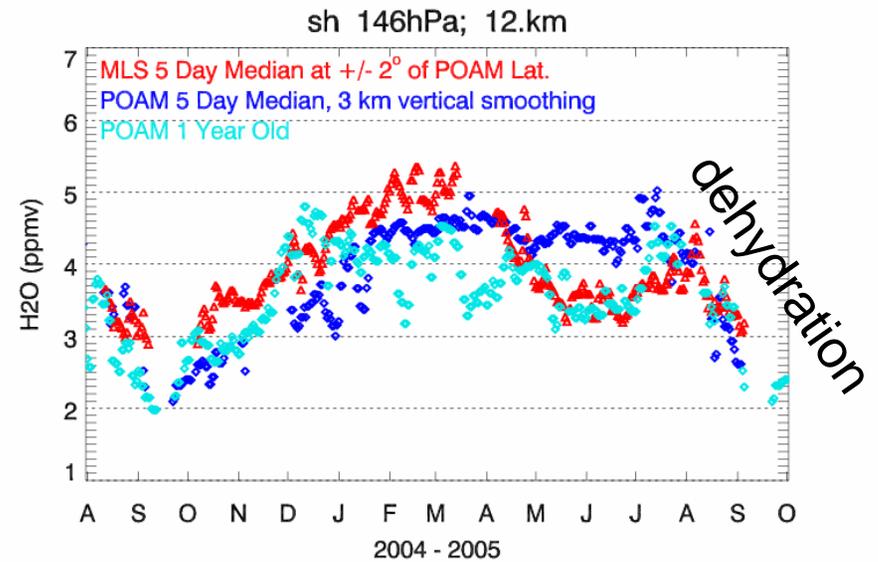
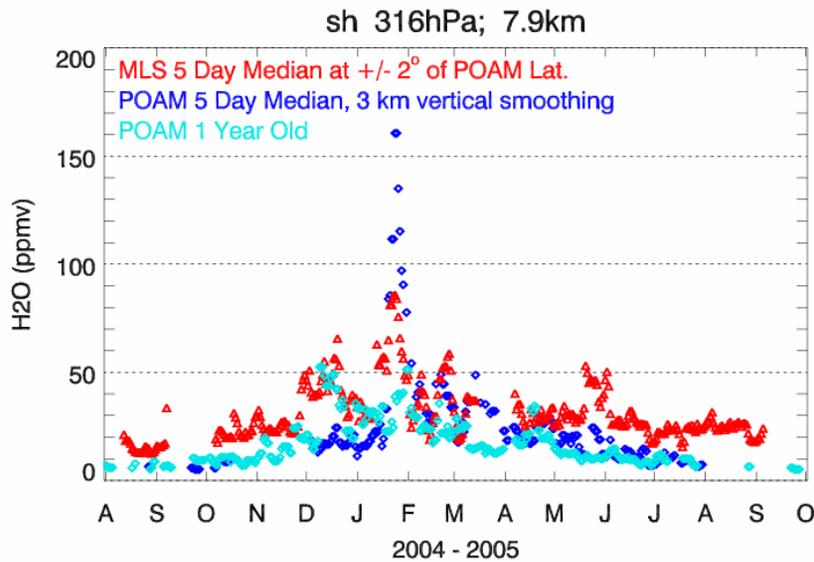
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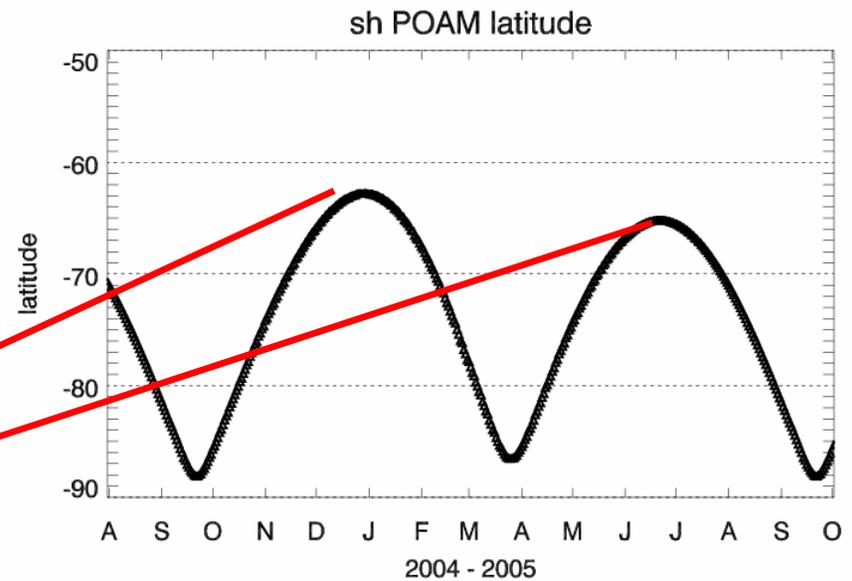
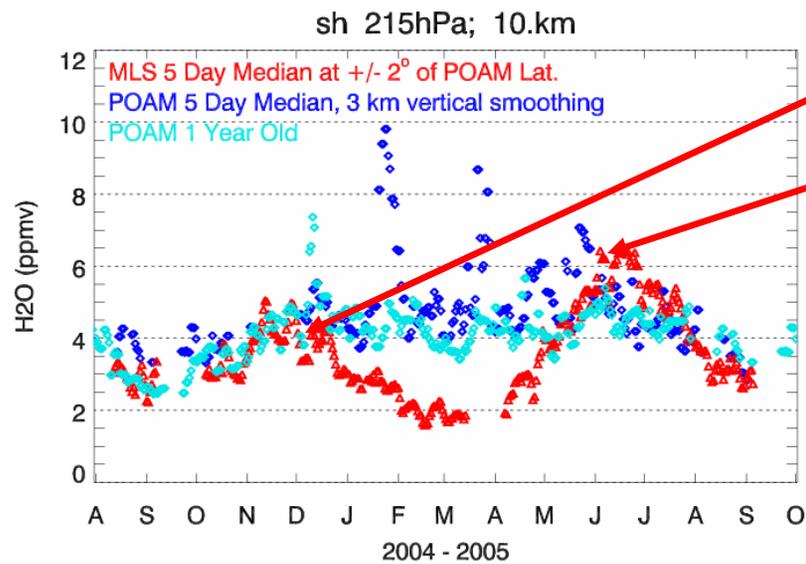
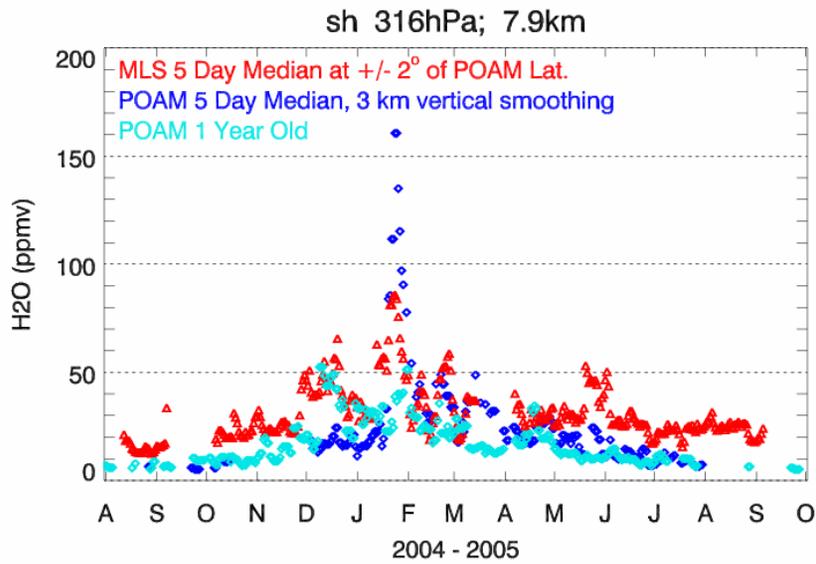
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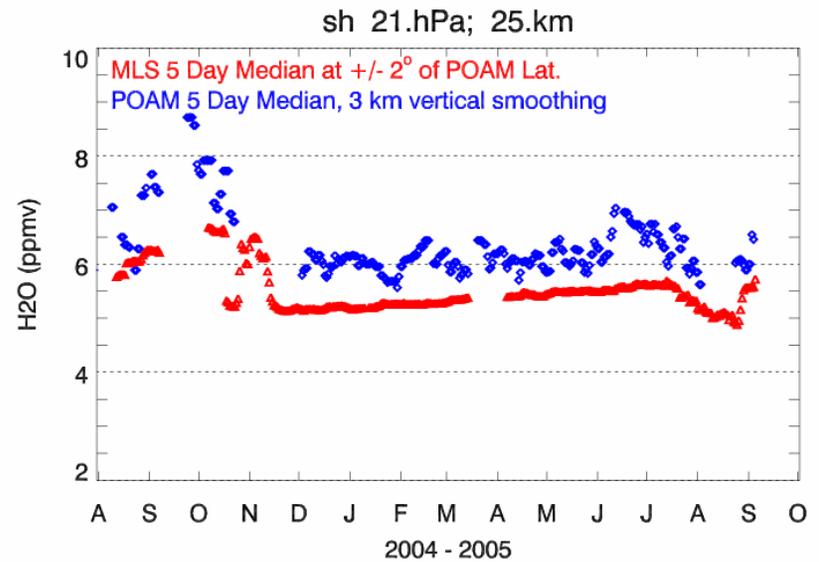
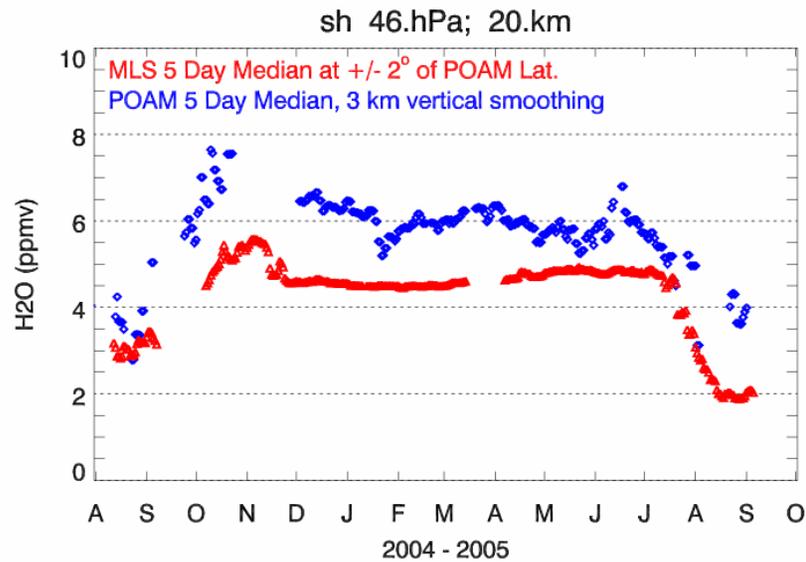
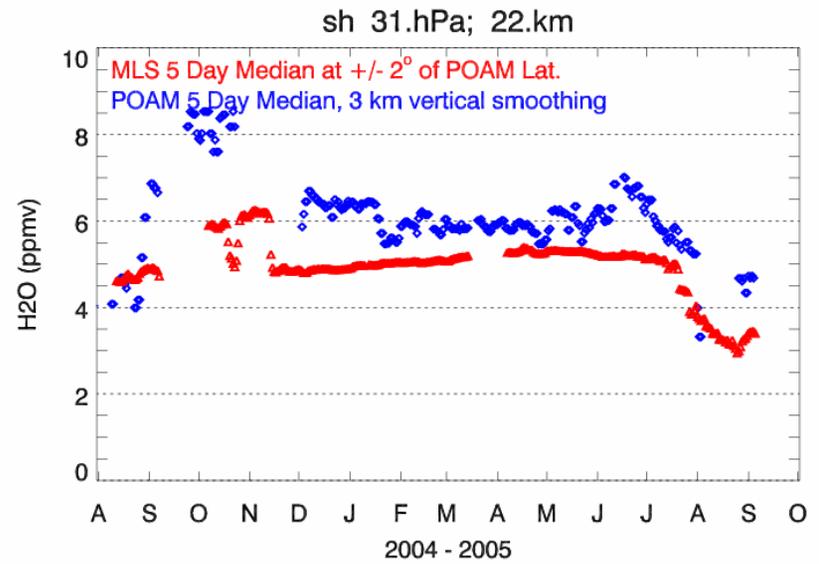
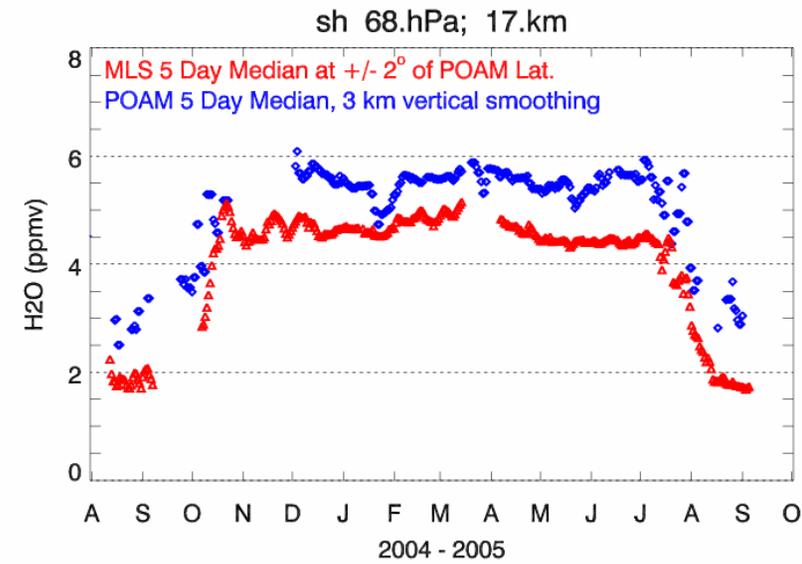
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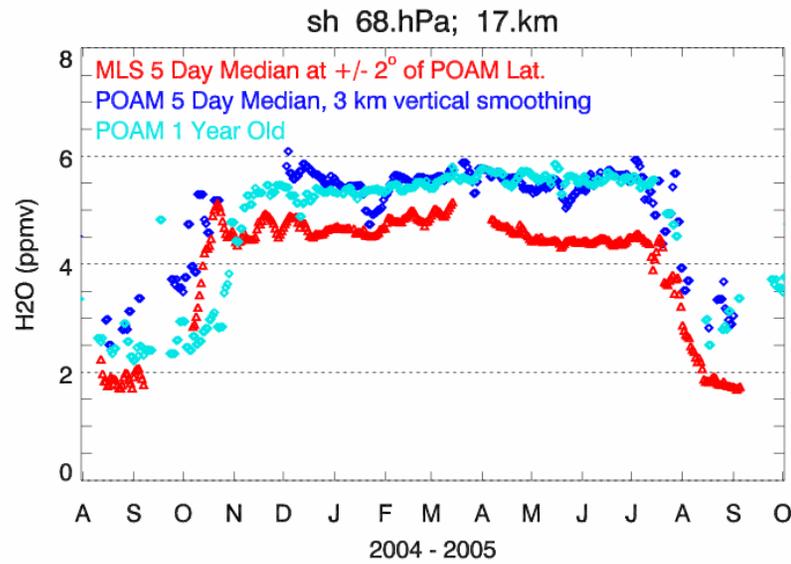
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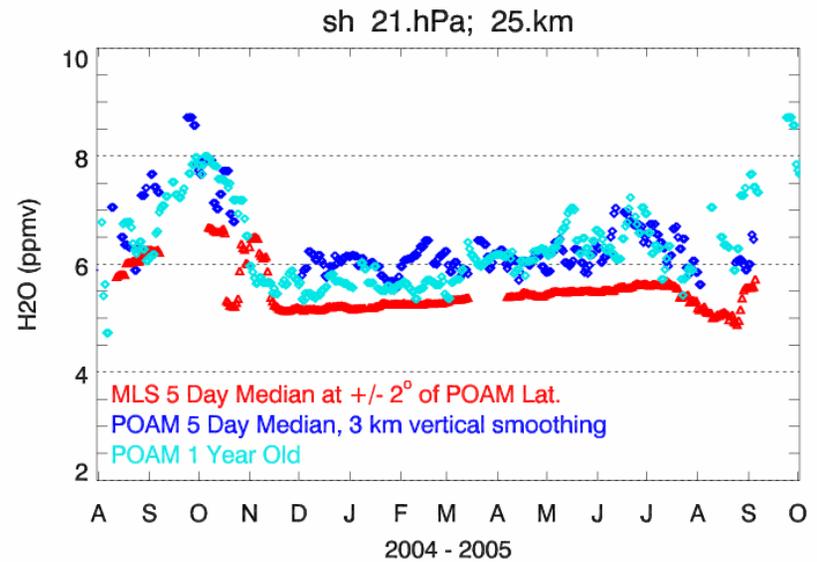
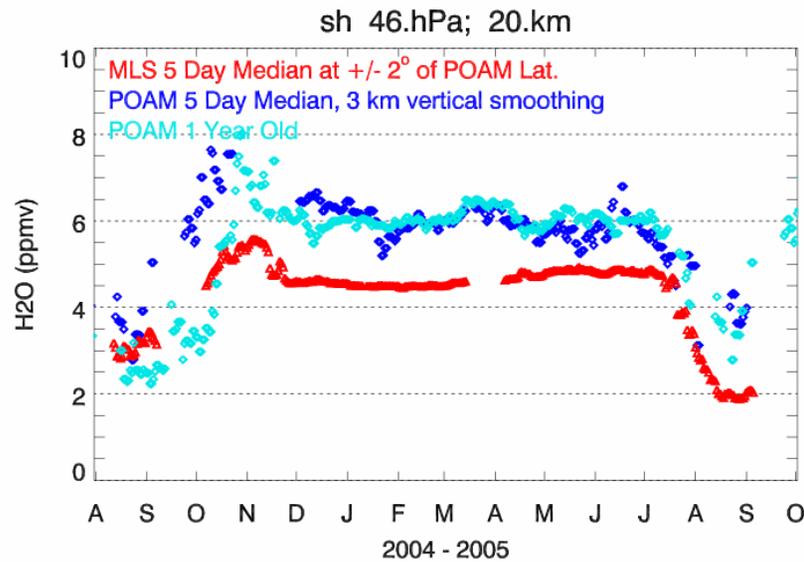
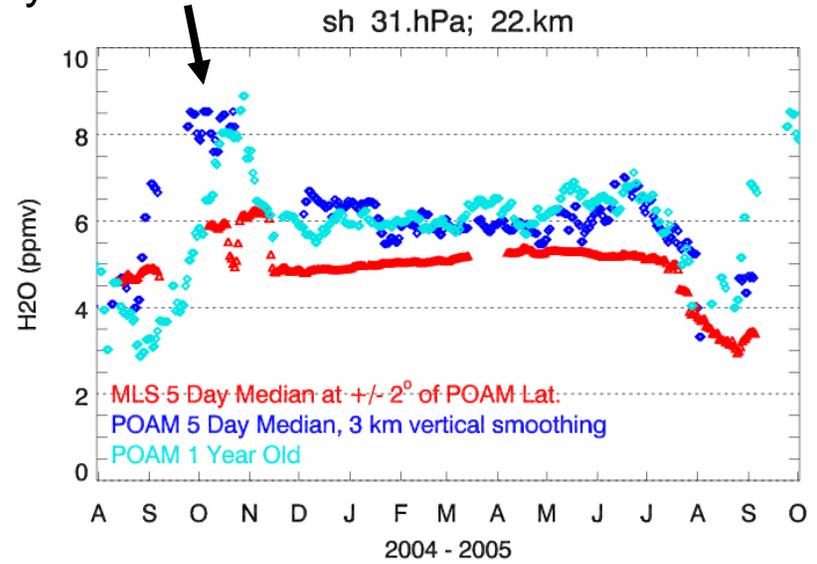
POAM-MLS comparisons: Southern Hemisphere



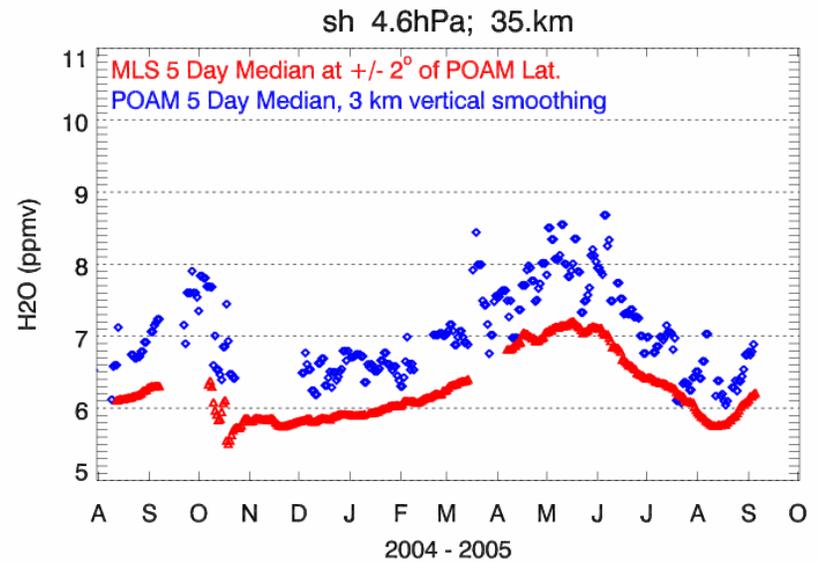
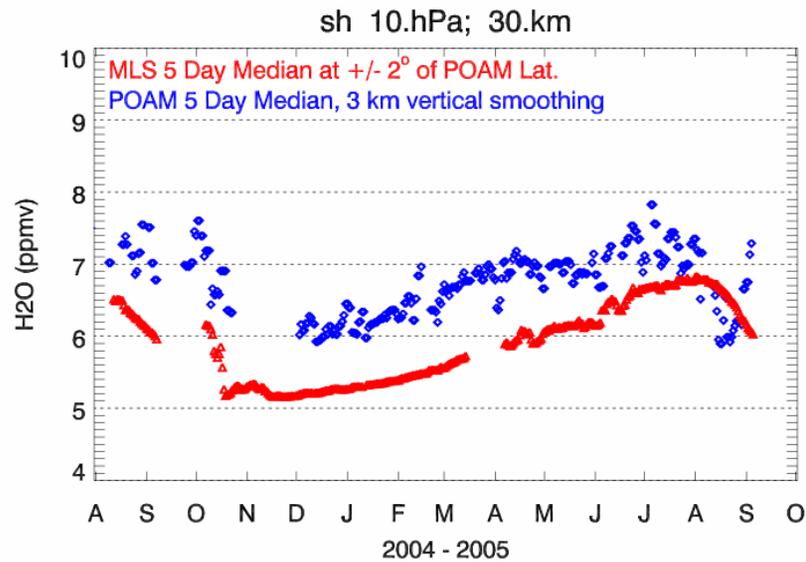
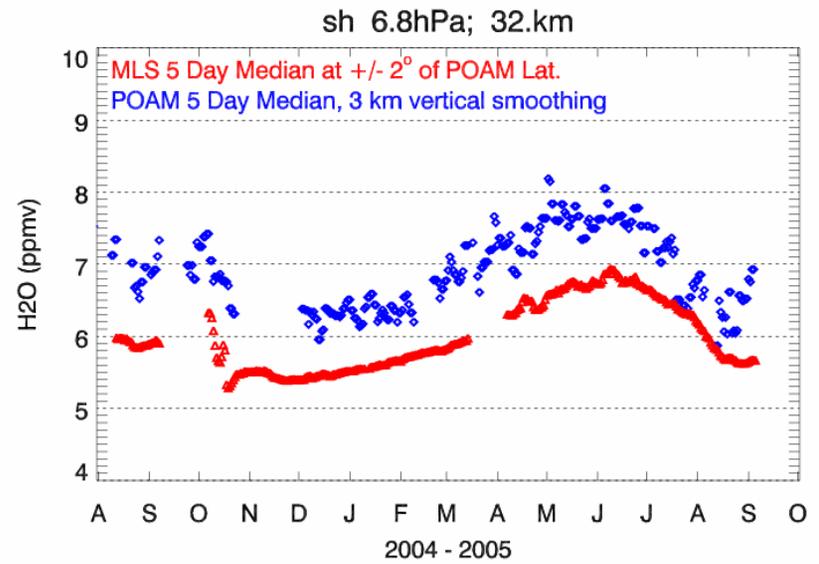
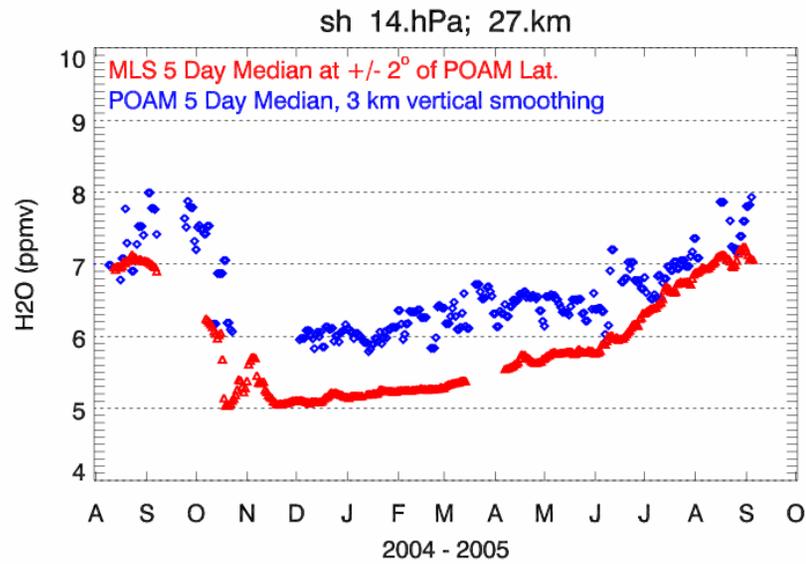
POAM-MLS comparisons: Southern Hemisphere



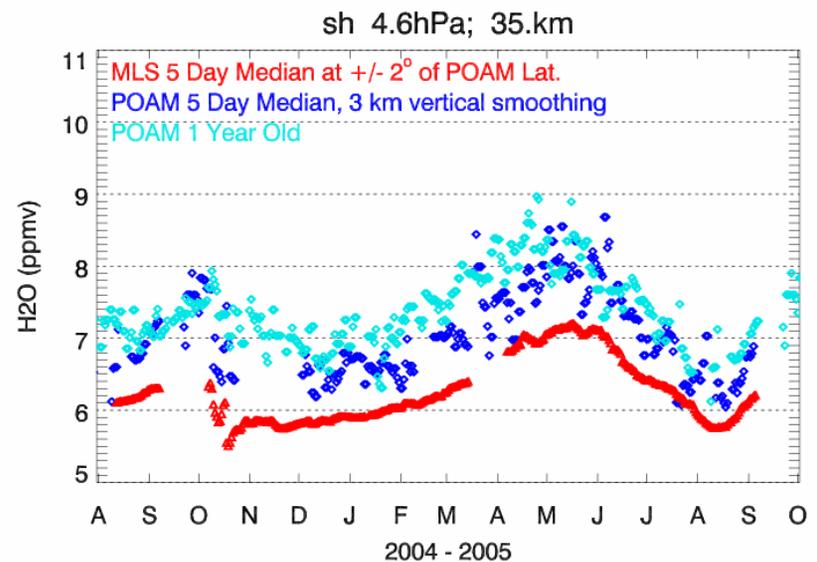
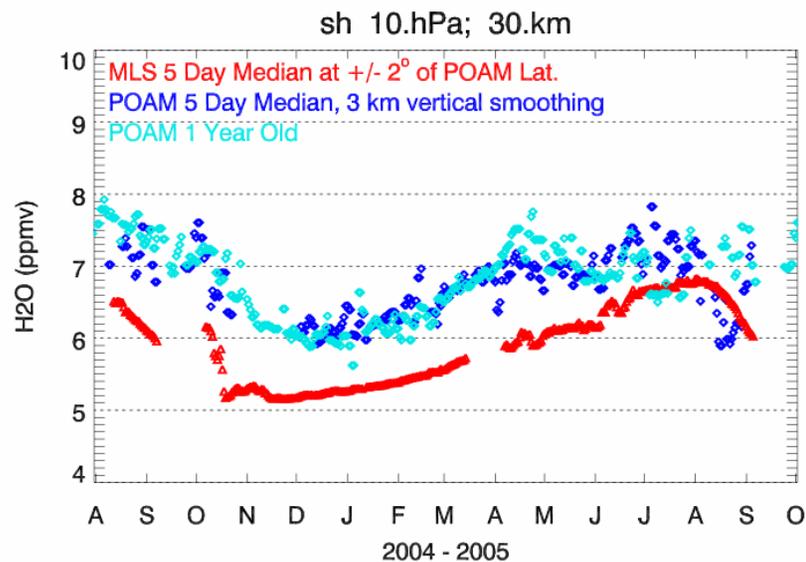
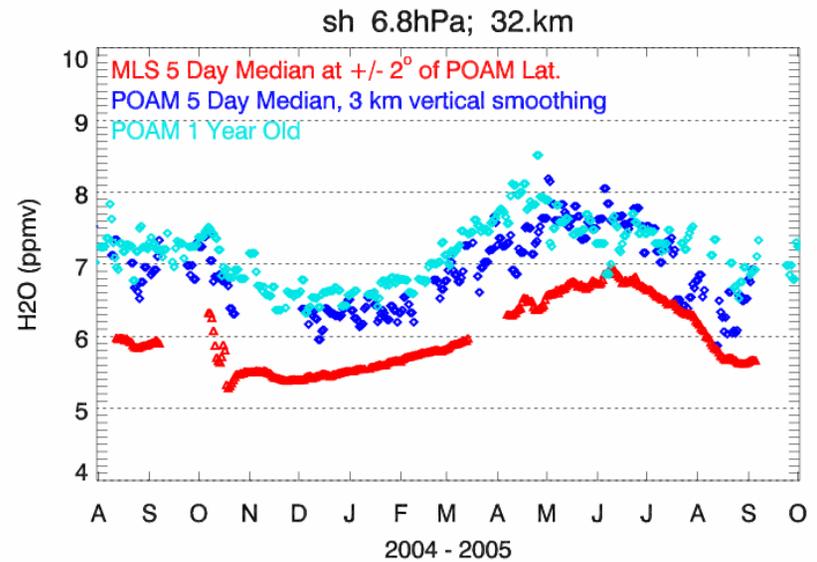
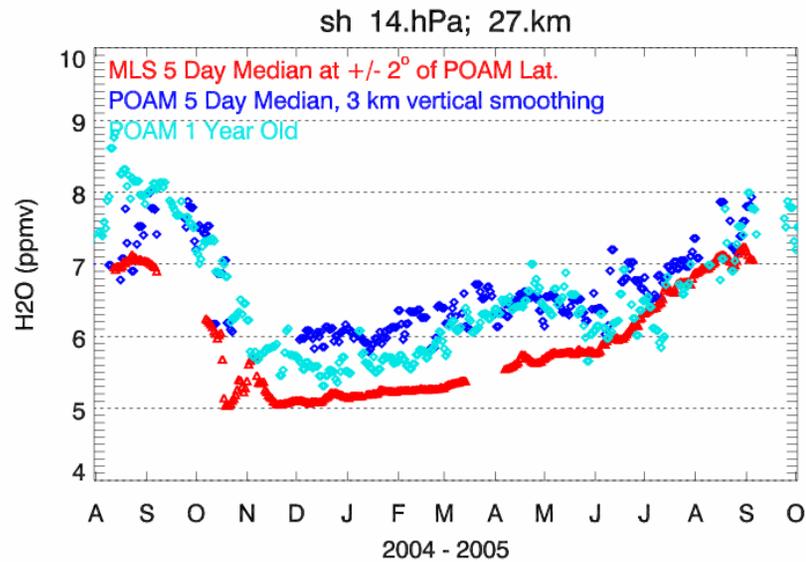
Rehydration overshoot



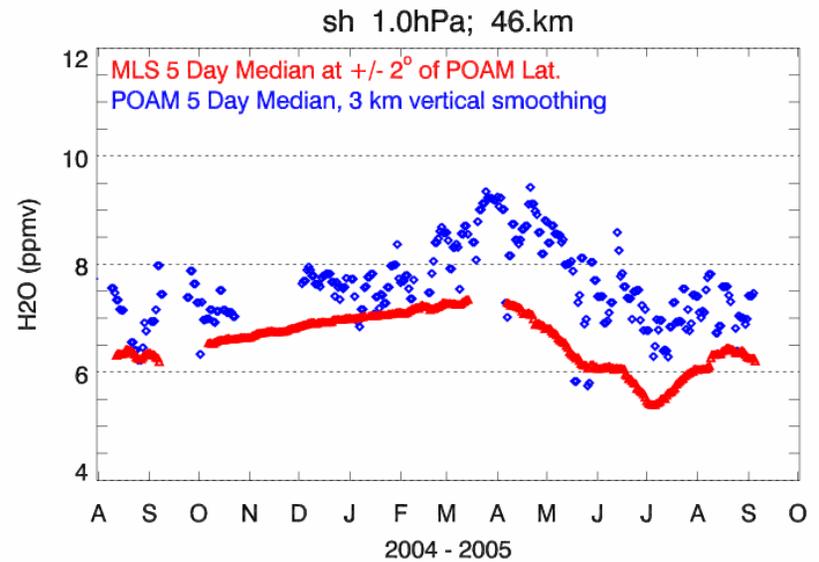
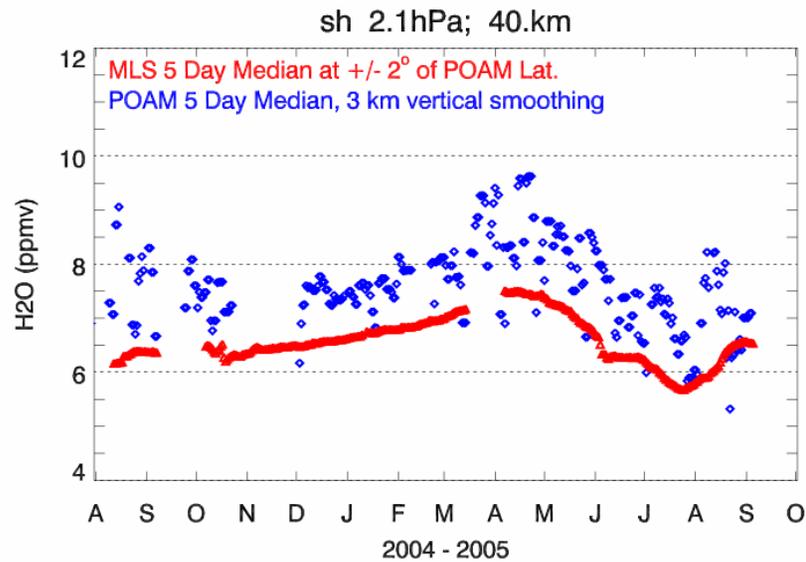
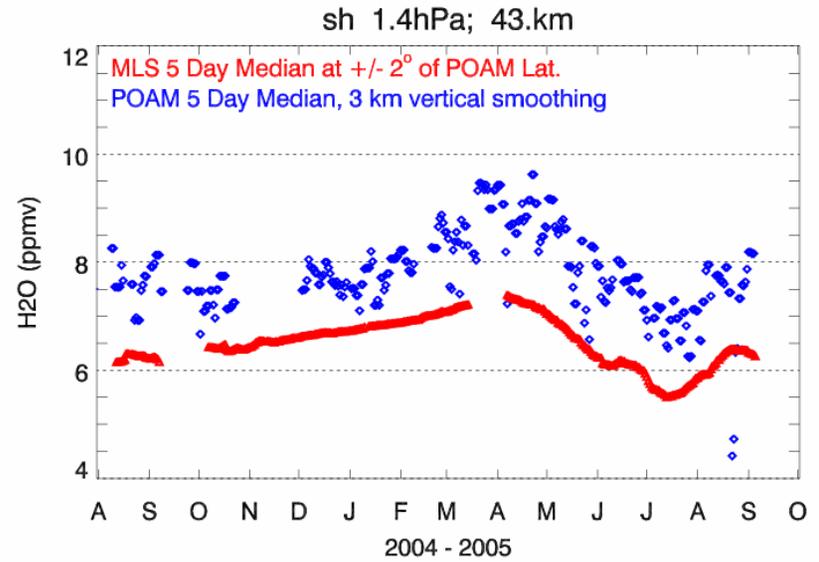
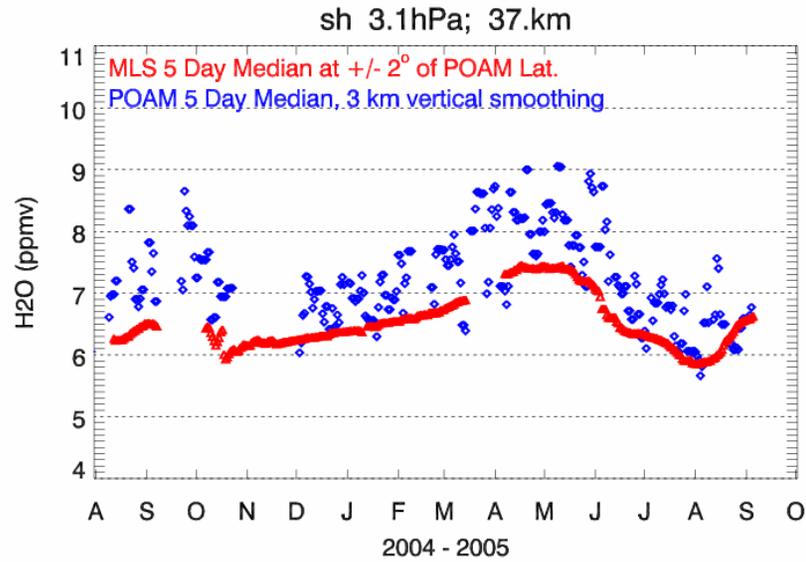
POAM-MLS comparisons: Southern Hemisphere



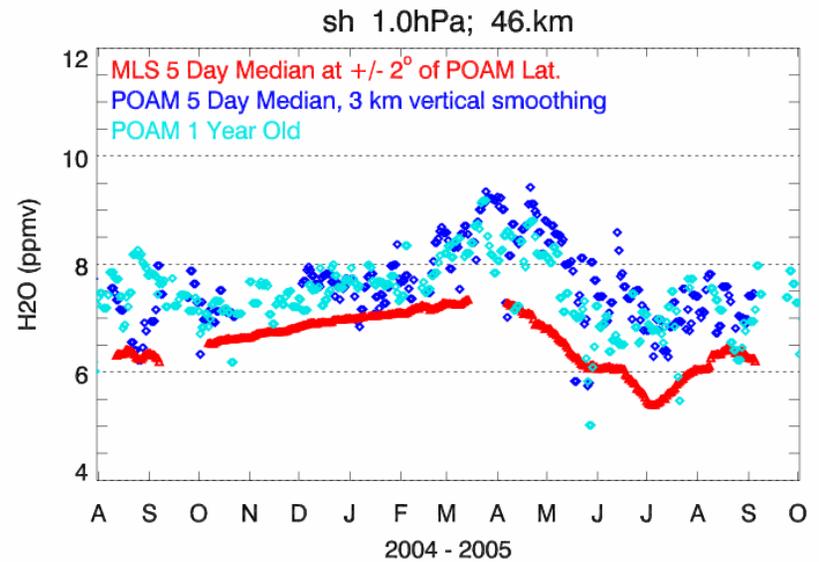
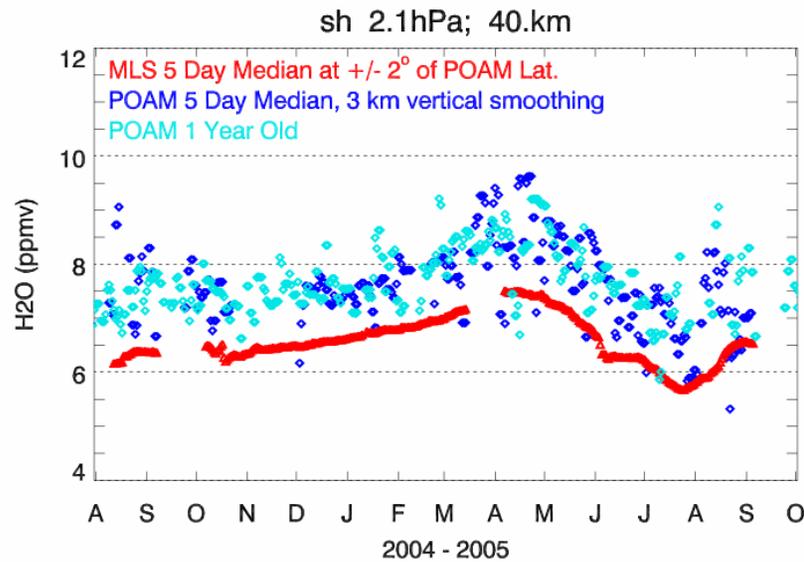
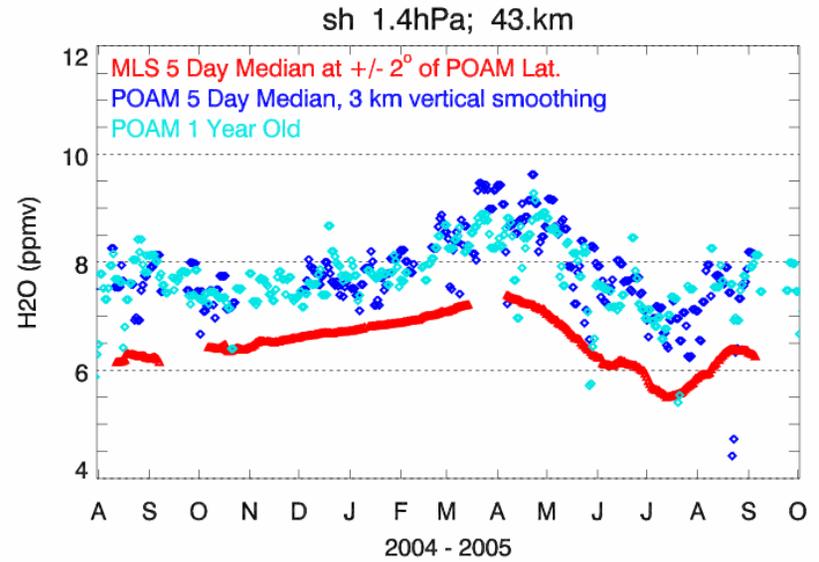
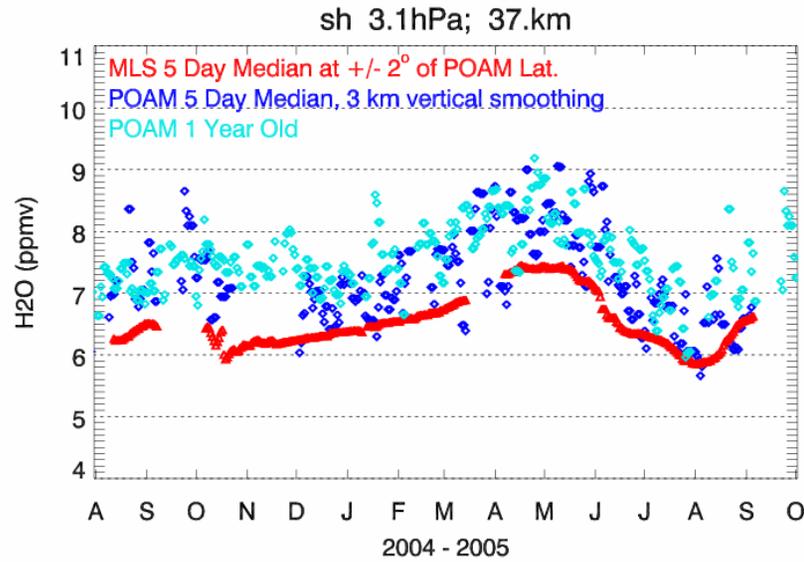
POAM-MLS comparisons: Southern Hemisphere



POAM-MLS comparisons: Southern Hemisphere



POAM-MLS comparisons: Southern Hemisphere



Summary of H₂O comparisons

- WVMS-MLS comparisons:
 - Convolved MLS average profiles agree to within ~5% of WVMS values.
 - MLS slightly higher than WVMS at Lauder, and lower at Mauna Loa.
 - Seasonal variations are in reasonable agreement, but comparisons are made difficult by lack of MLS data above ~64km.
- POAM-MLS comparisons:
 - POAM measurements somewhat higher in SH, good agreement in NH (known POAM SH/NH difference).
 - Good agreement at 316 hPa, even for tropospheric air
 - Generally excellent agreement in seasonal variations from the troposphere into the upper stratosphere, with some exceptions:
 - MLS semi-annual variation at 215 hPa in SH where POAM sees only small variations. Seemingly coupled to latitude change.
 - Both instruments show a seasonal peak in SH 31 hPa data when rehydration occurs in September/October (probably non-dehydrated air which has descended), but the POAM peak seems too large.