SCIAMACHY Limb water vapour

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SCIAMACHY

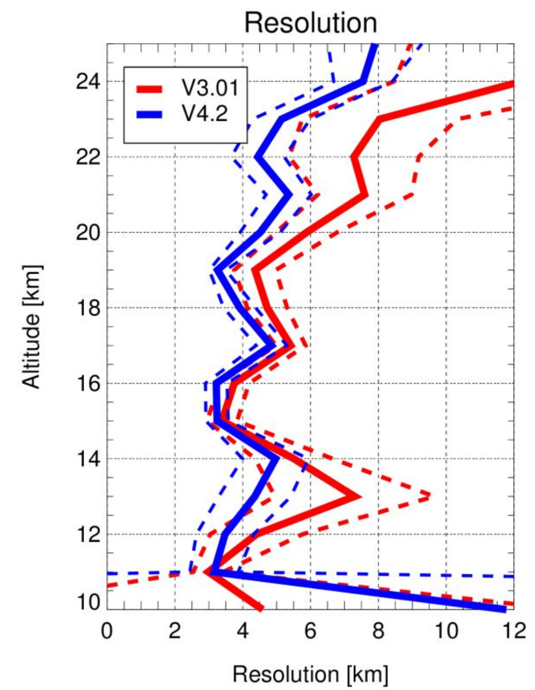
Small version history: V3 to V4.2

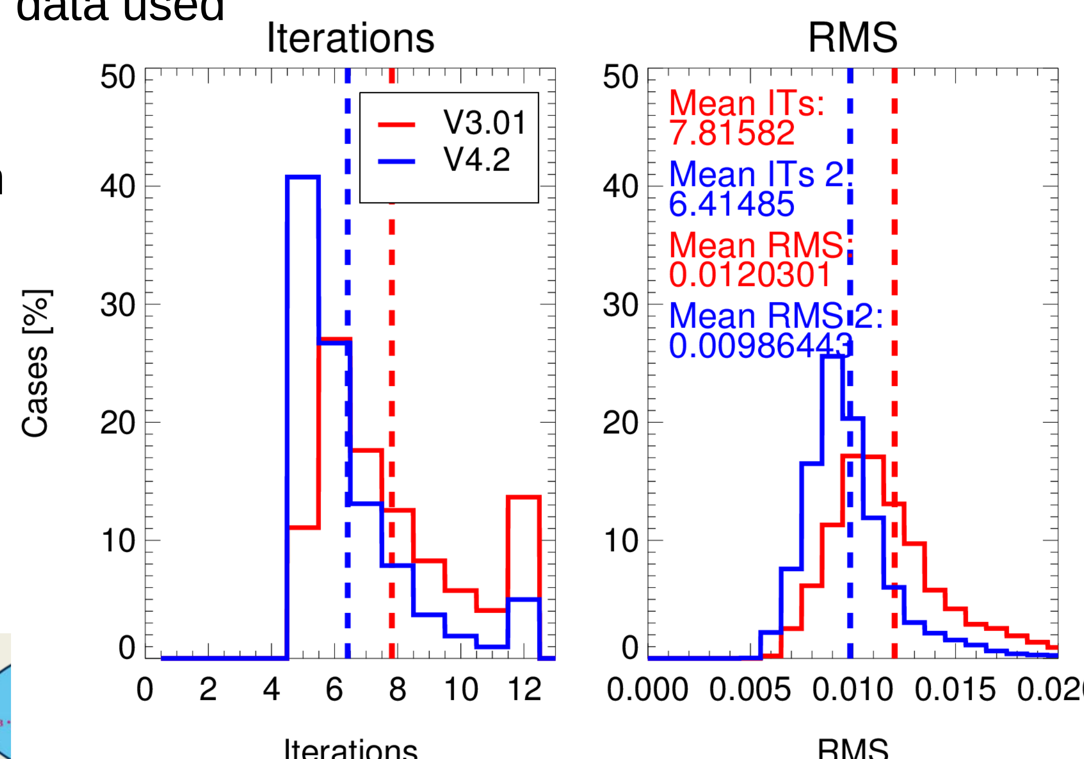
Version	Published/ used in	Processed data	Comment
V3	Rozanov et al. (2011) AMT	Only test cases and data used in comparisons	SCIATRAN V3.1.8 (?), L1V6.03
V3.0	Used in SPARC-DI (Hegglin et al., 2013)	Every 8th day globally and every 4th day 45°S-45°N	SCIATRAN V3.1.21, L1V7.03/04
V3.01	Weigel et al. (2016) SPIN Reports/ SPARC WAVAS	Every 8th day globally and every 2nd day 45°S-45°N, end-to-end tests	Differs to V3.0 only through filter and sampling
V3.02	SPIN Reports	Every 8th day globally and every 2nd day 45°S-45°N	Differs to V3.01 only through filter
V3.03.xxx		Usually 15.02.2005 or 19.02.2012	Test versions with SCIATRAN 3.5.2 from Stefan Kowalewski
V3.5.1.xxx		Usually 19.02.2012 or orbit 52157	Test versions with SCIATRAN 3.5.10
V4.0		Every 32th day	As V3.5.1.197 with geometric height in ECMWF, L1V8.01/02
V4.0.xxx		Usually 19.08.2011 or orbit 49525 and end-to-end tests	Test versions with SCIATRAN 3.5.10 (to improve aerosol)
V4.1		Every 32th day, 2004-2005 end-to-end tests	As V4.0.42 with SCODA V218, L1V8.01/02
V4.2		Processing started, every 8th day finished, next: every day 45°S-45°N	As V4.1 but ECMWF data as a priori

V4.2 - changes compared to V3.01

- **H2O retrieval**:
  - SCIATRAN V3.5.10, using MPI
  - Height grid on measurement altitudes and 2 steps between each measurement (~1.1km)
  - Different variation of the smoothness coefficient for the first order Tikhonov constraint with height
  - Changed regularisation for aerosol scaling and tropospheric correction parameter
- **Aerosol correction retrieval**:
  - Different regularisation and height grid
  - Solar spectrum as reference, including albedo retrieval and radiometric calibrated data used
  - Mie model used, different a priori
- **Auxiliary data**:
  - L1 V8.01/02, additional pointing correction
  - HITRAN 2012
  - ECMWF Era Interim temperature and pressure, altitude corrected, H2O as a priori
  - SCODA V218

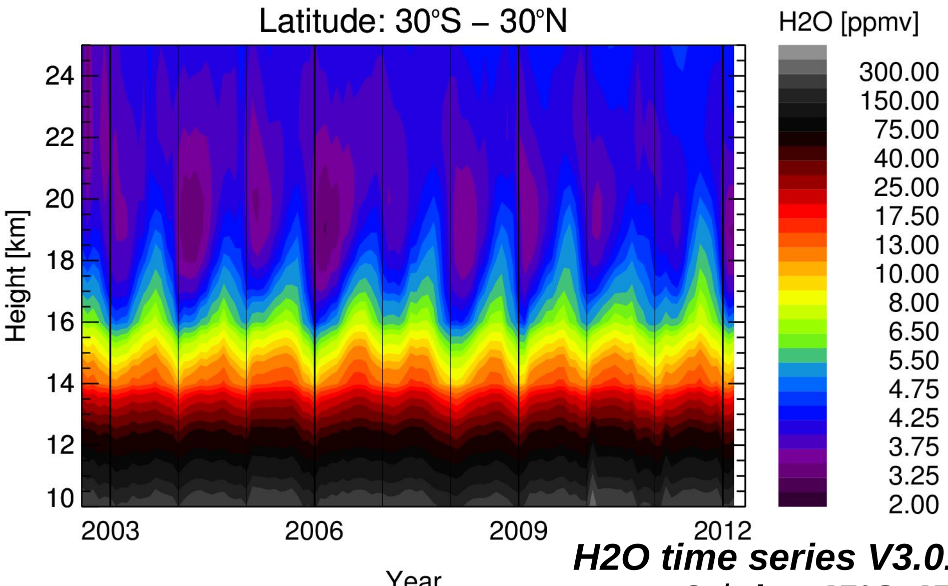
► **V4.2 shows improved convergence and vertical resolution as well as smaller residuals.**

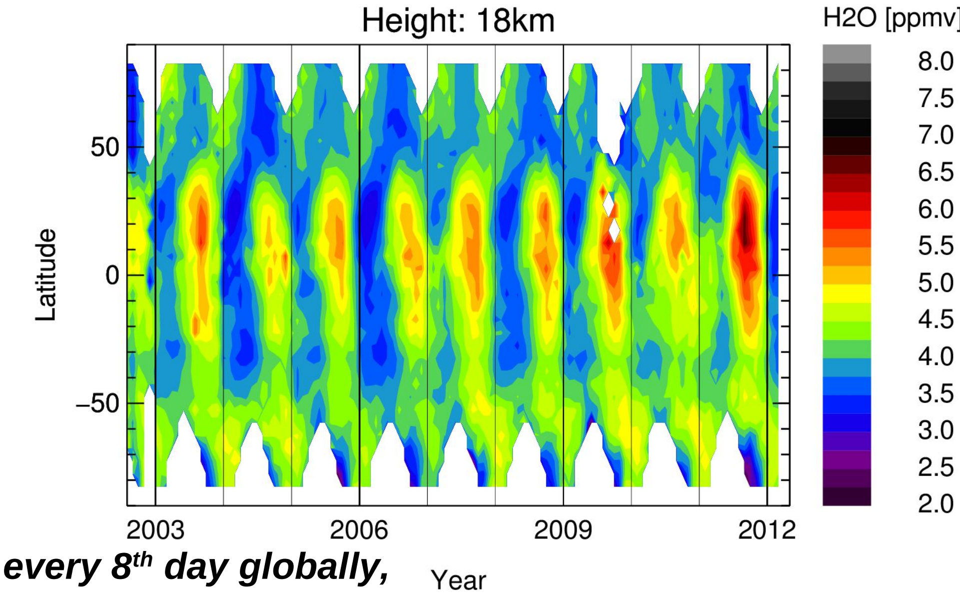




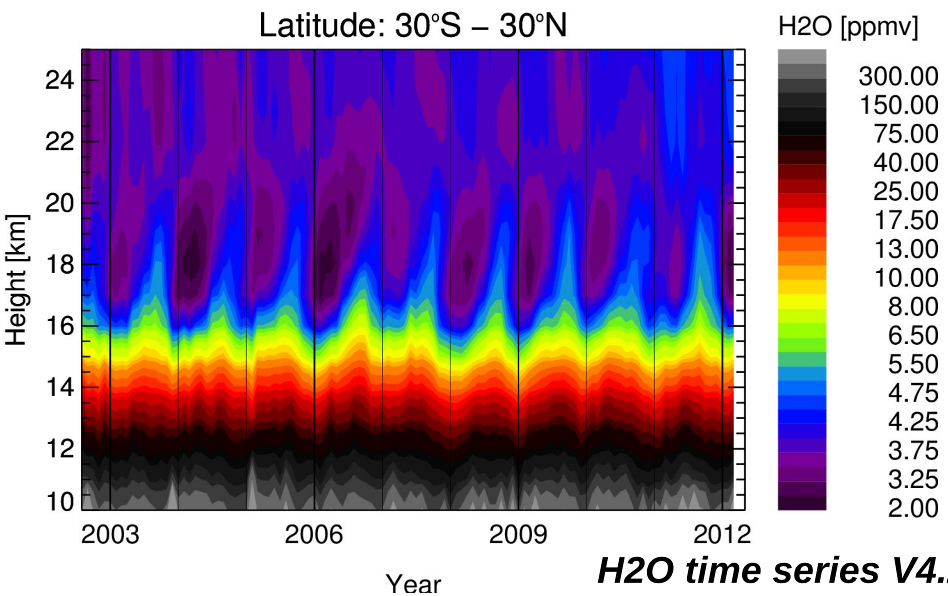
2005, 6776 cases

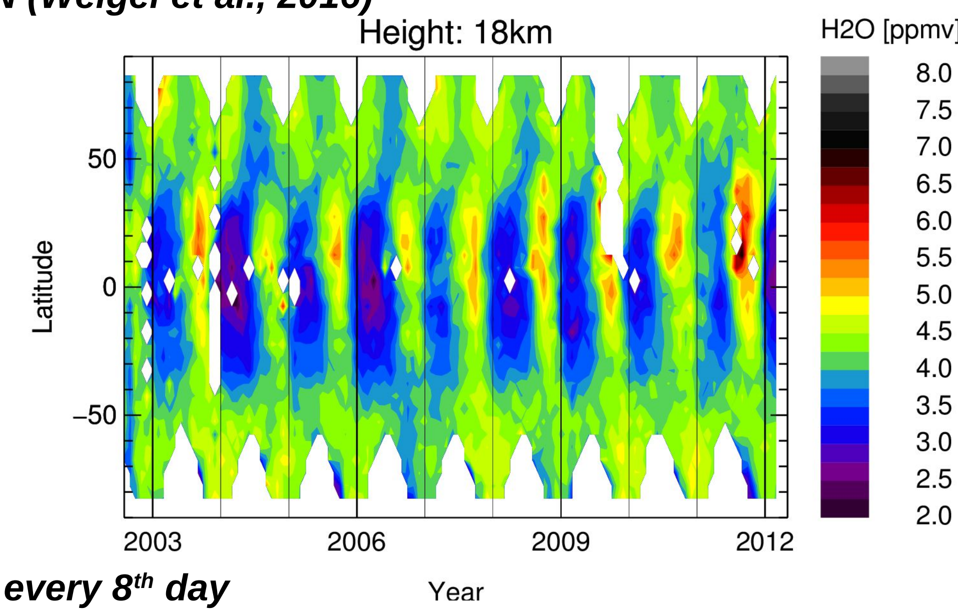
V4.2 compared to V3.01





H2O time series V3.01 every 8th day globally, every 2nd day 45°S-45°N (Weigel et al., 2016)

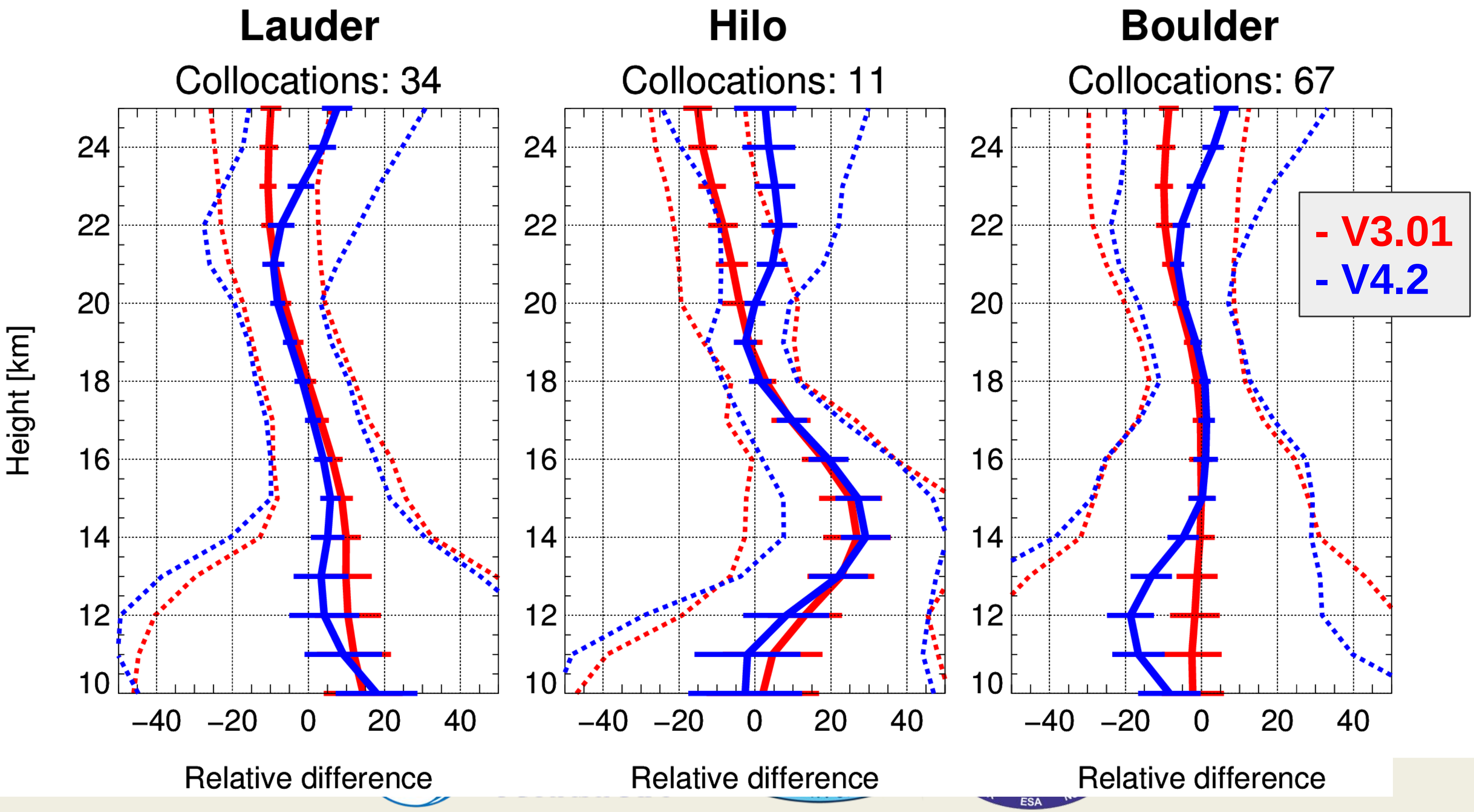




H2O time series V4.2 every 8th day

Comparison to balloon FPH

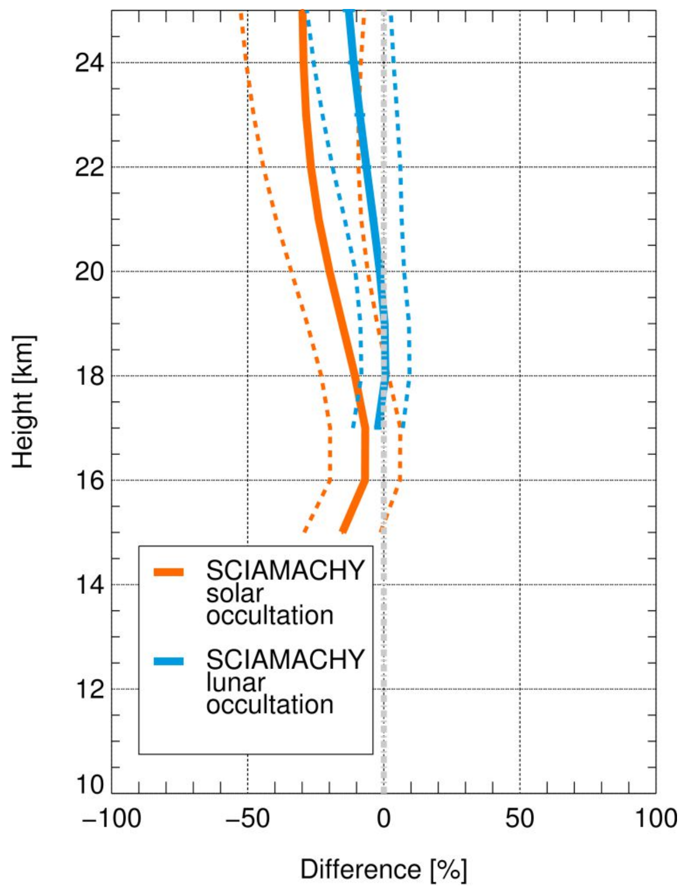
- Balloon FPH, collocation criteria: distance < 1000km, time difference < 6h
- Same profiles for V3.01 and V4.2, smoothed with SCIAMACHY limb AVK
- Mean percentage difference: SCIA-FPH/((SCIA+FPH)*0.5) * 100, standard deviation (dotted) and standard error of the mean (error bars)
- Better agreement especially above about 19km



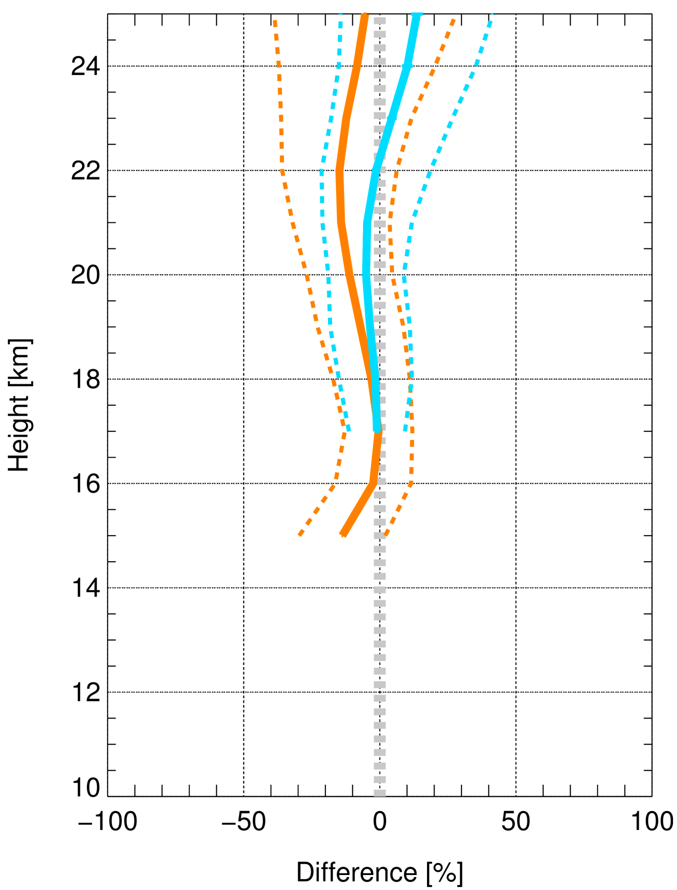
Comparison to SCIAMACHY solar occultation profiles

- SCIAMACHY solar occultation V1.0, collocation criteria: distance < 500km, time difference < 12h
- Mean percentage difference: Limb-Occ/((Limb+Occ)*0.5) * 100, standard deviation (dotted) and standard error of the mean (error bars)

V3.01



V4.2



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Outlook for SQWG-3

- Process denser/complete time series based on L1V8
  - Processing is time consuming, time depends on available resources on high performance computers
  - Complete processing probably not ready to the end of 2016
  - Processing of complete data based on L1V9 not possible within SQWG-3, small test data set planed when L1V9 is available
- Provide data also as netCDF
- Validation, documentation, and publication (based on every 8th day or every 8th day globally and every day 45°S-45°N)

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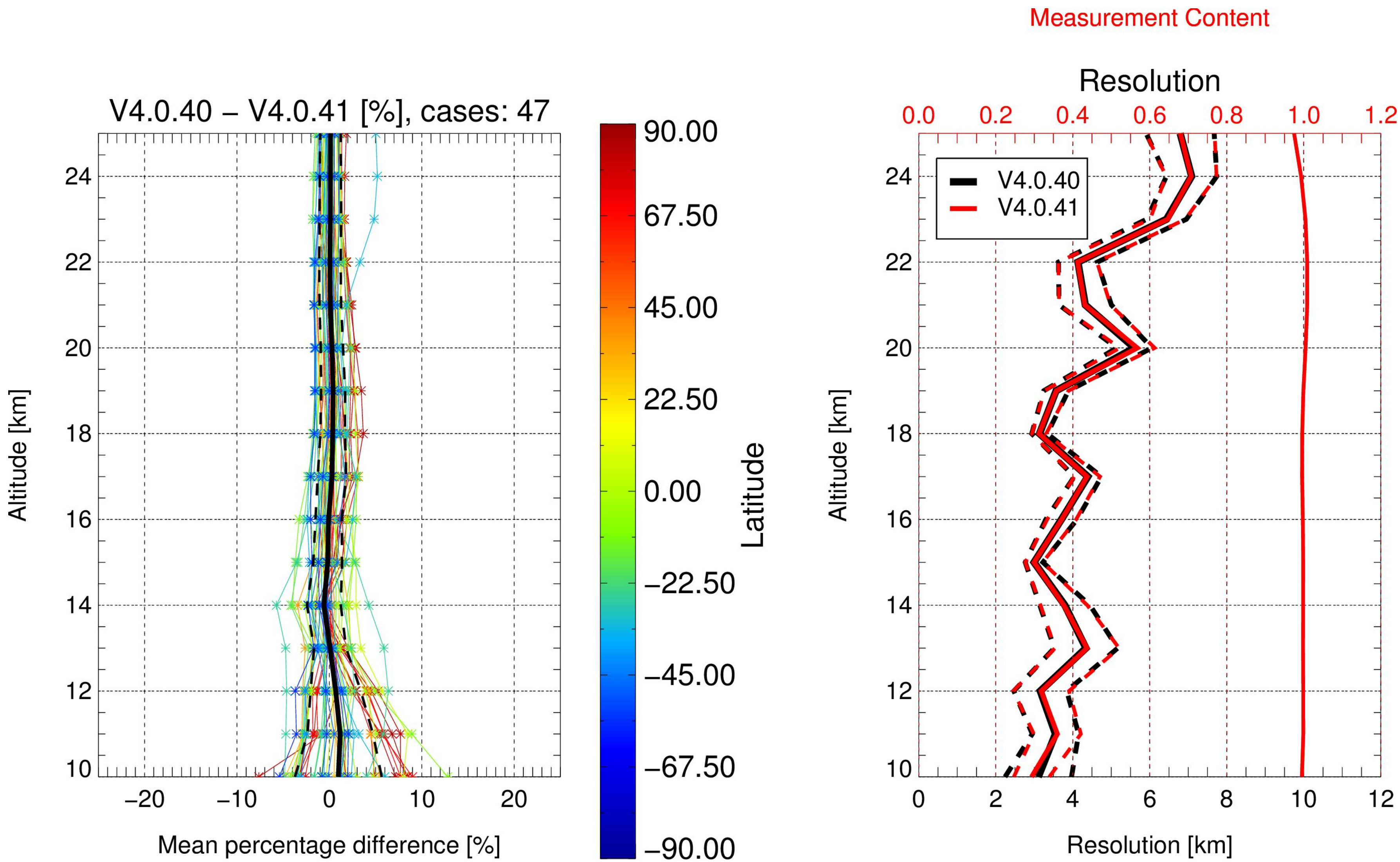
Pointing correction



Orbit 49525

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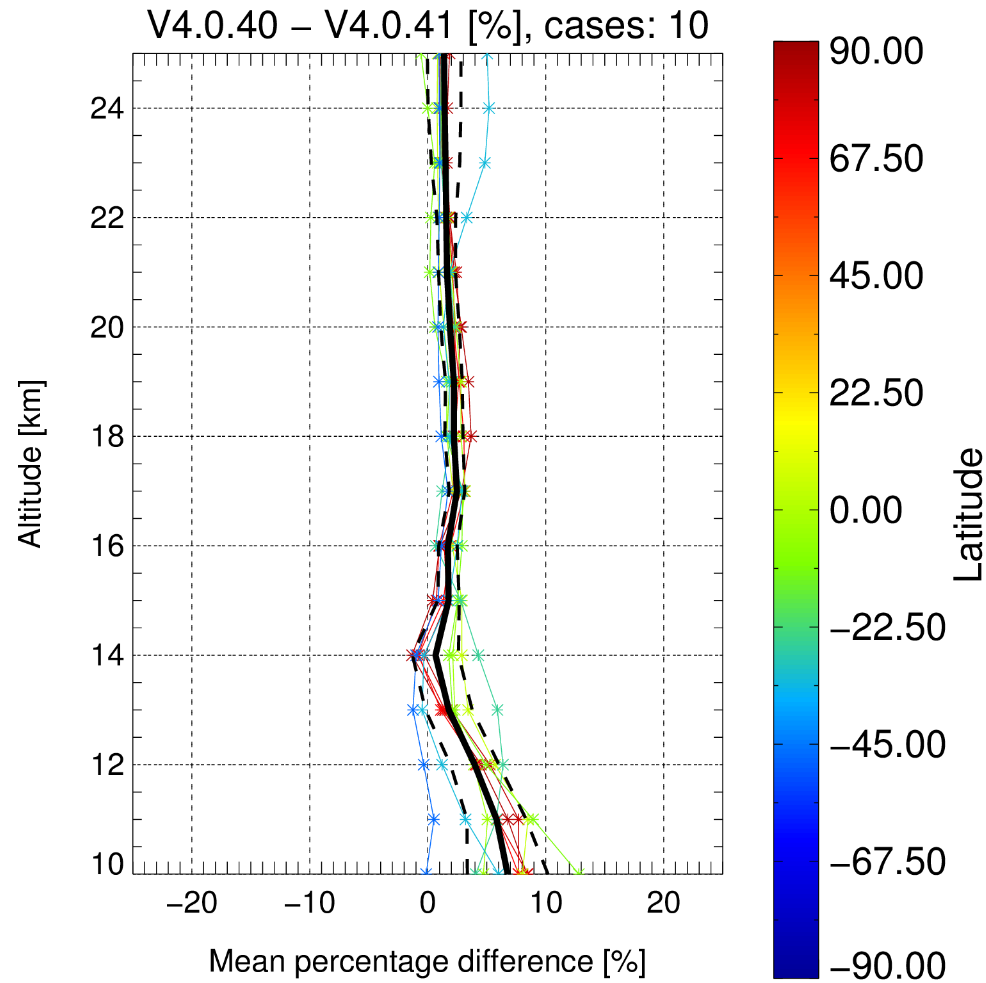
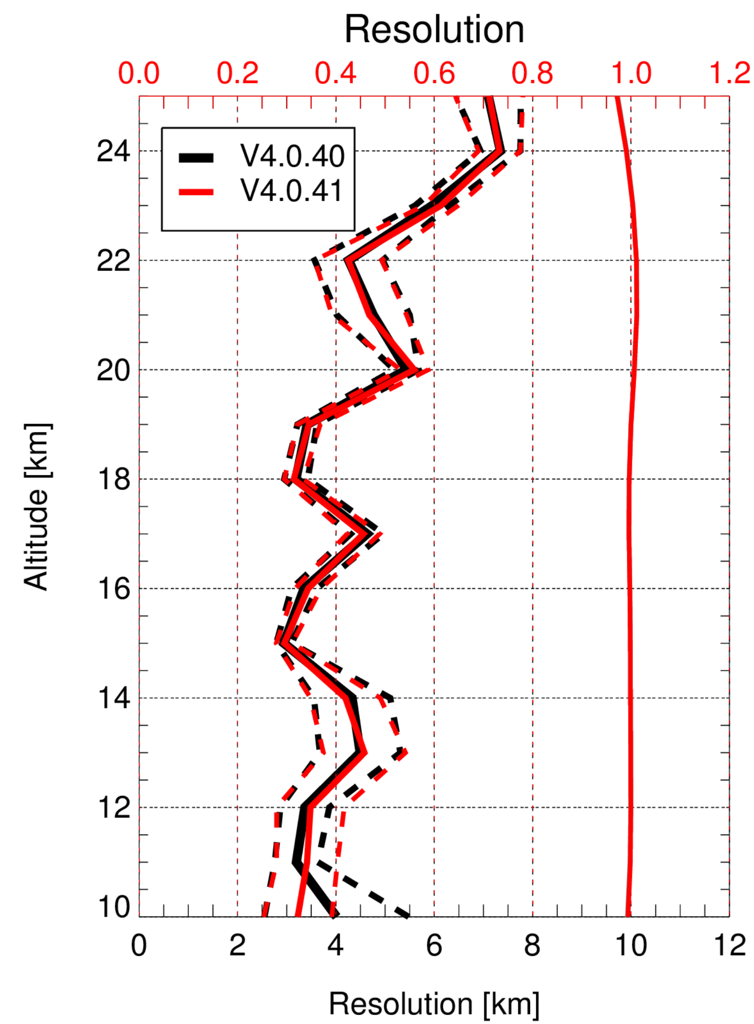
SCIAMACHY

Stratospheric Change and its Role for Climate Prediction SHARP FUB • DLR • JWGU • MPI-M • KIT • UH • UBR • MPI-C DFG-Forschergruppe BDC OCF WV STC MAN

Pointing correction

Measurement Content





Orbit 49525, azimuth 0

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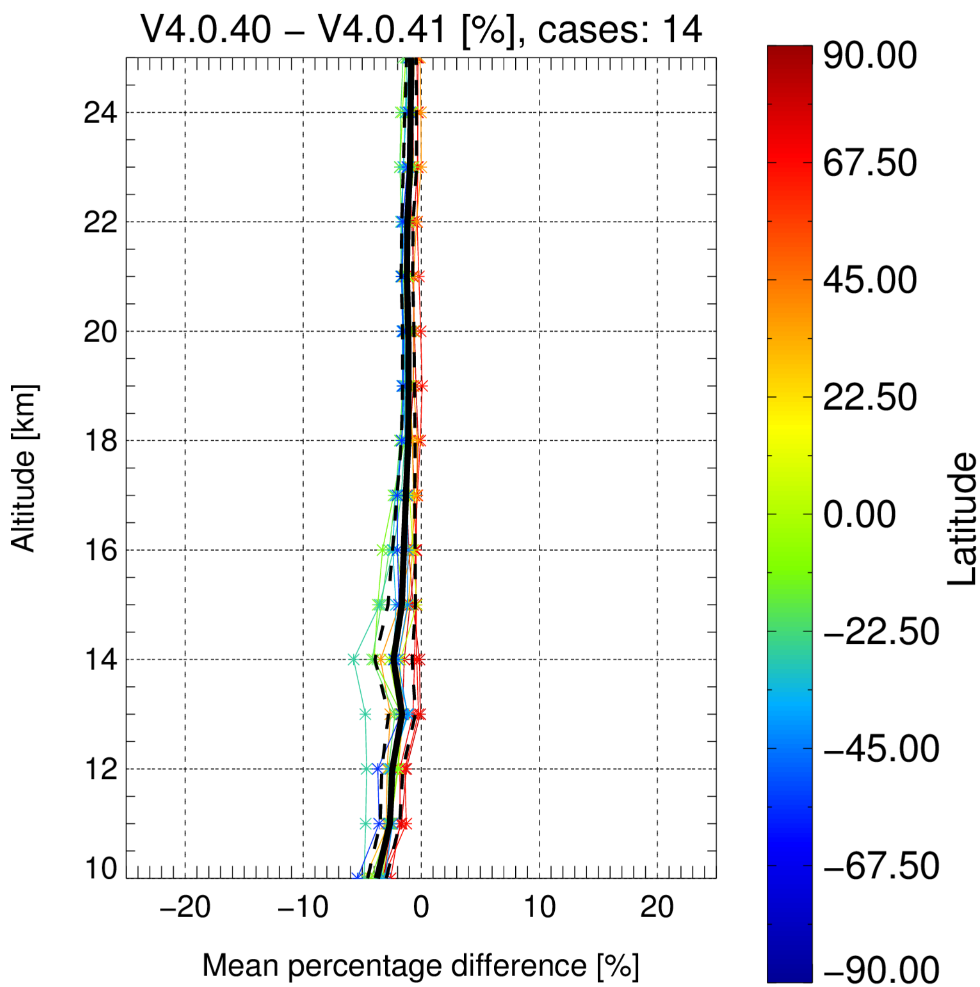
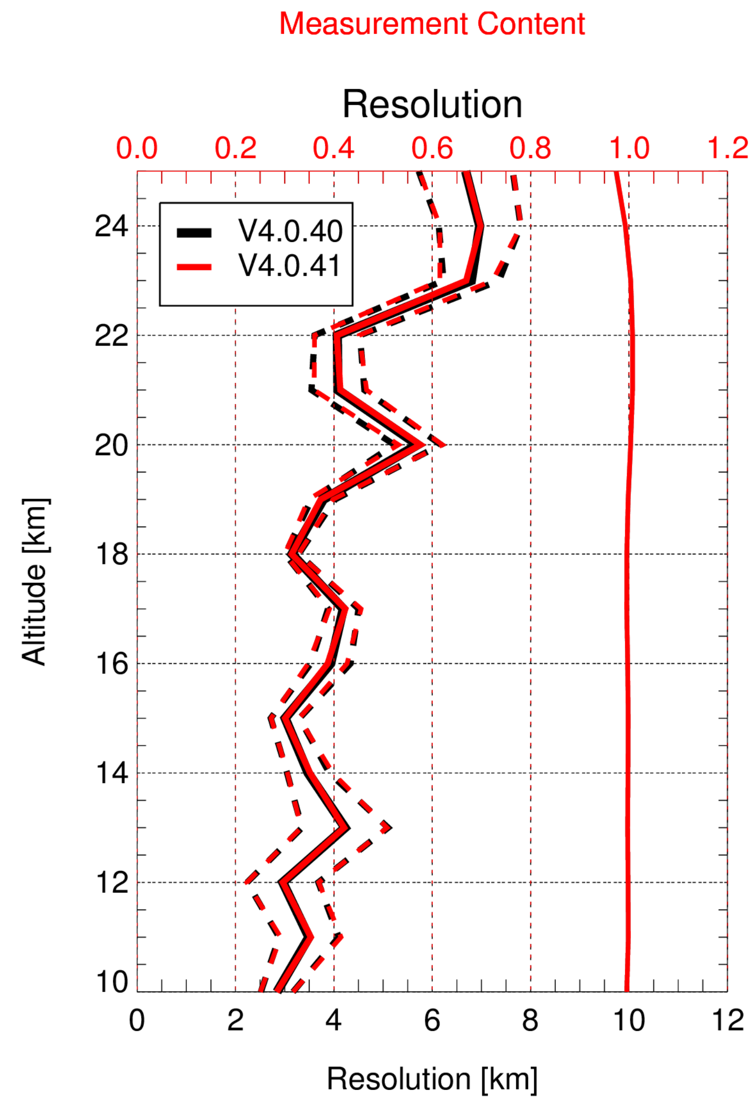
Pointing correction





Orbit 49525, azimuth 3

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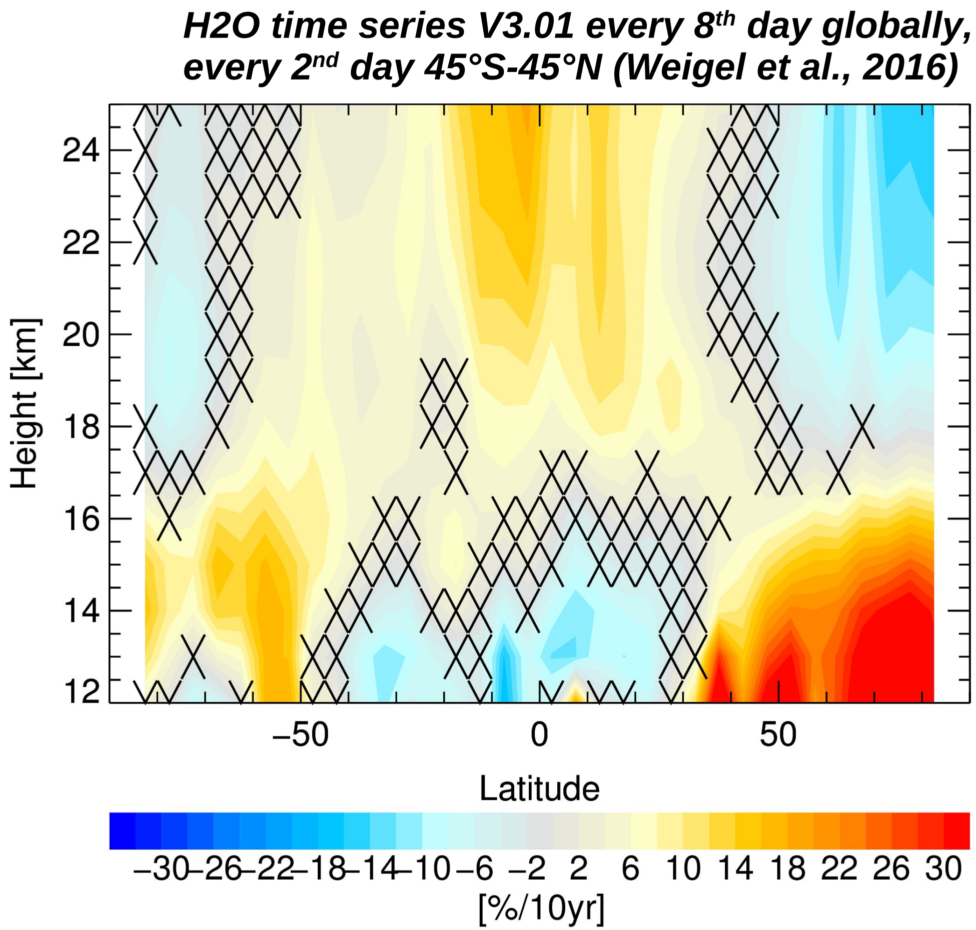
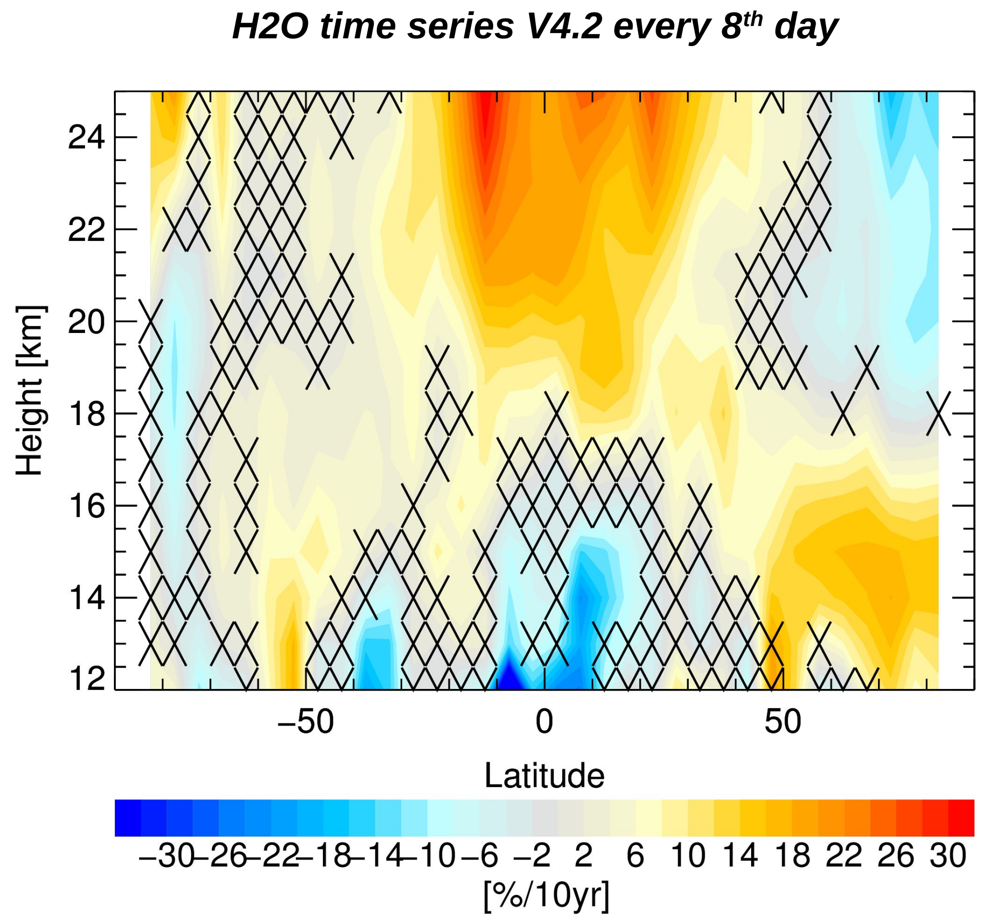
V4.2 compared to V3.01 - Trends





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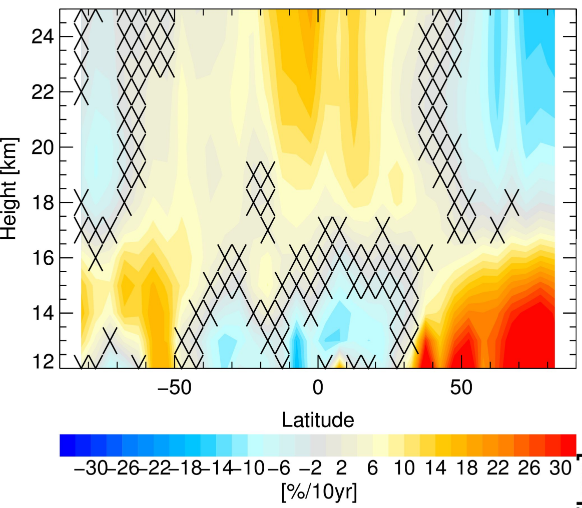
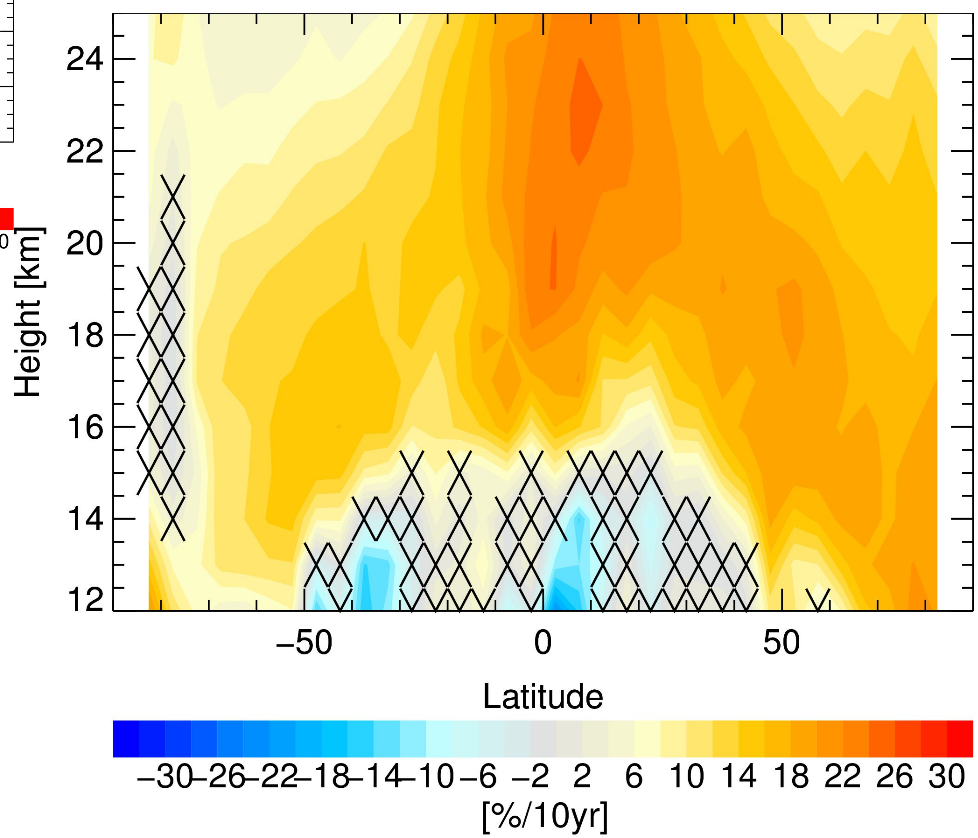
V4.2 compared to V3.01 - Trends

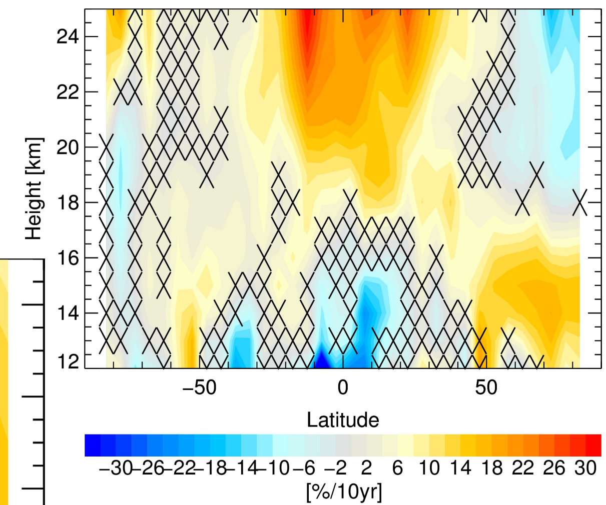
H_2O time series V3.01 every 8th day globally, every 2nd day 45°S-45°N (Weigel et al., 2016)



ECMWF EraInterim



H_2O time series V4.2 every 8th day



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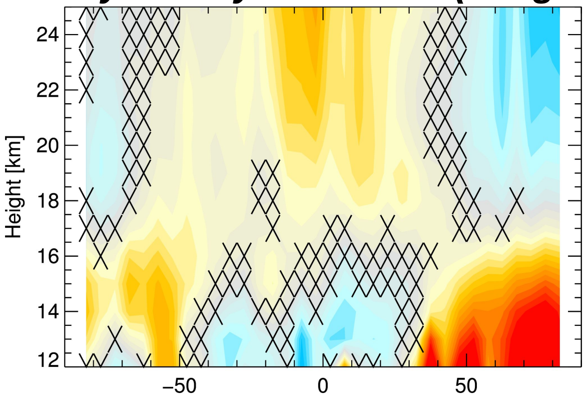
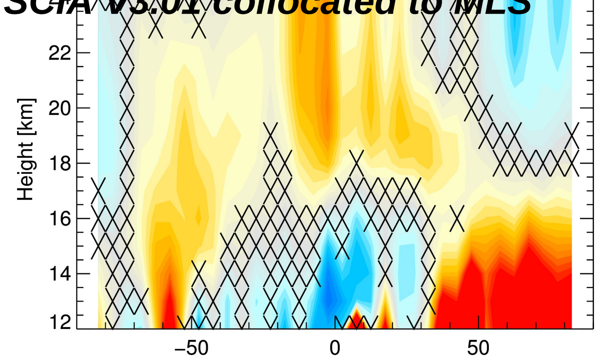
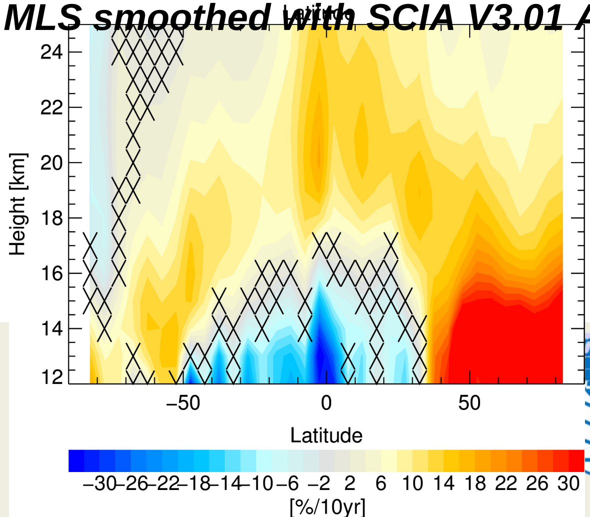


SCIA V3.01 collocated to MLS



MLS smoothed with SCIA V3.01 AVK



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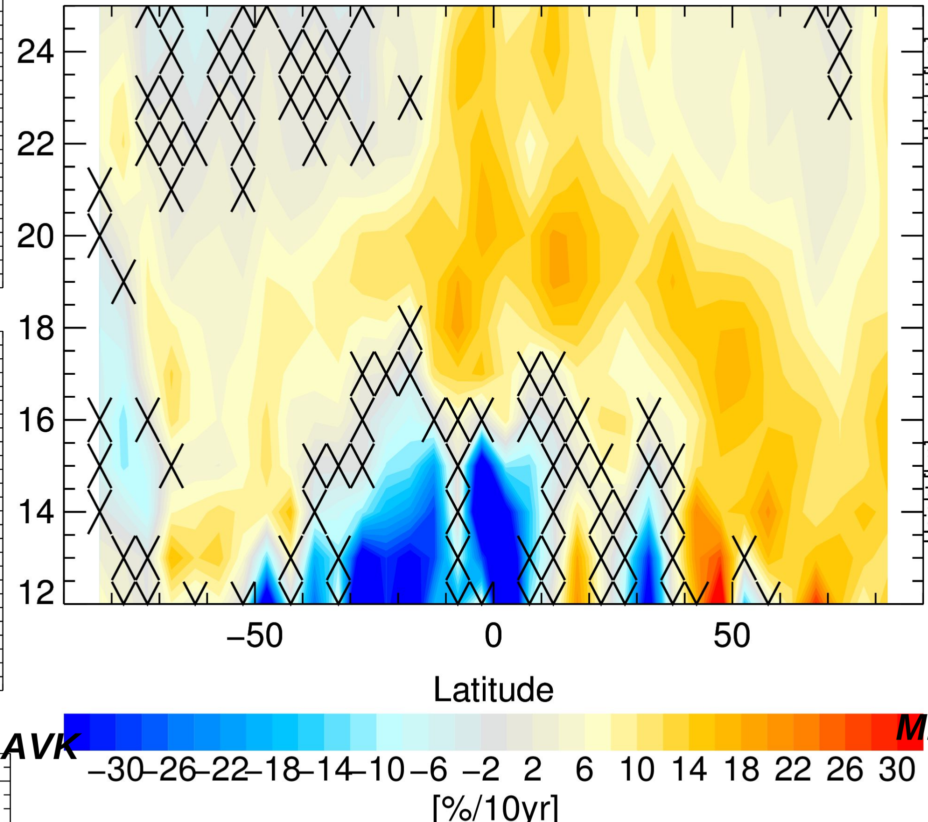
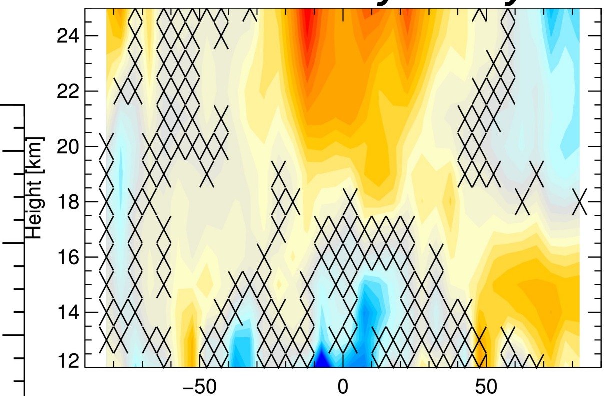
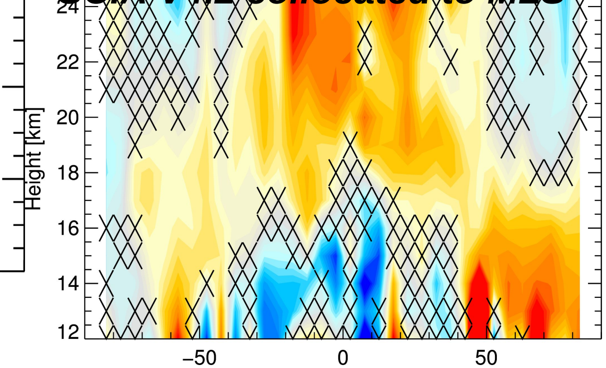


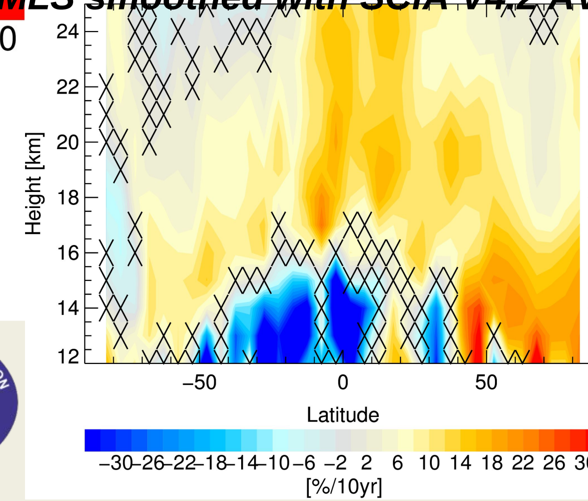
H2O time series V4.2 every 8th day



SCIA V4.2 collocated to MLS

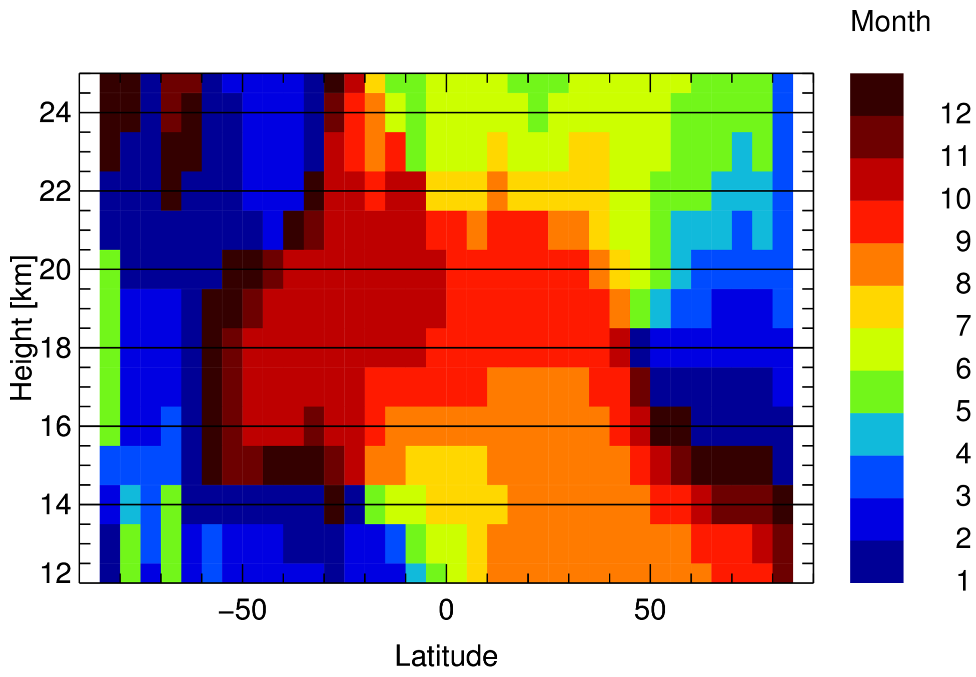


MLS smoothed with SCIA V4.2 AVK

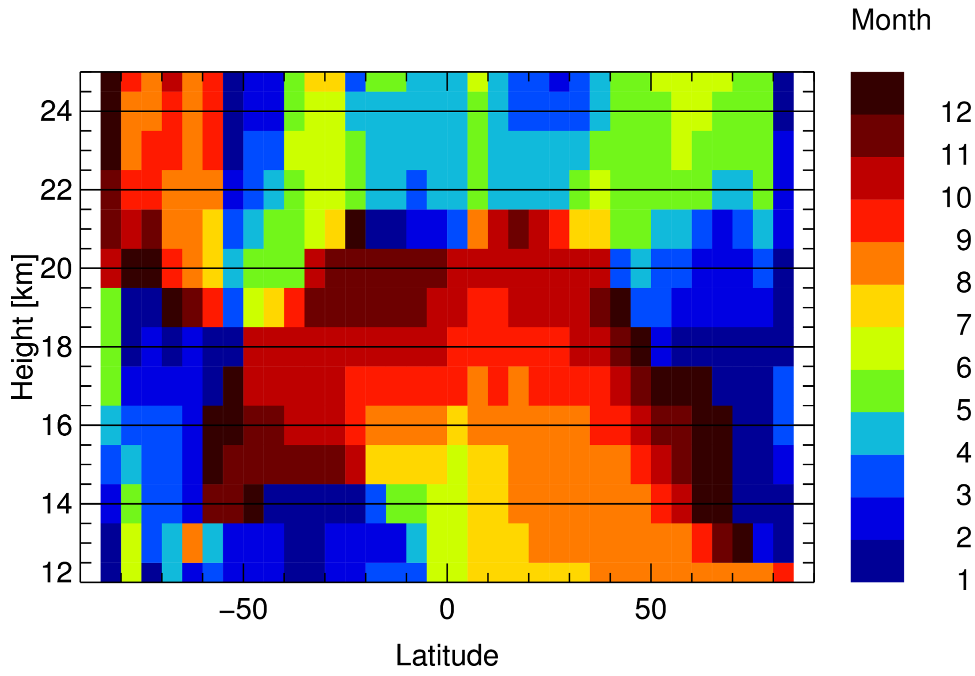


V4.2 compared to V3.01 - Annual cycle

H2O time series V3.01 every 8th day globally, every 2nd day 45°S-45°N (Weigel et al., 2016)



H2O time series V4.2 every 8th day



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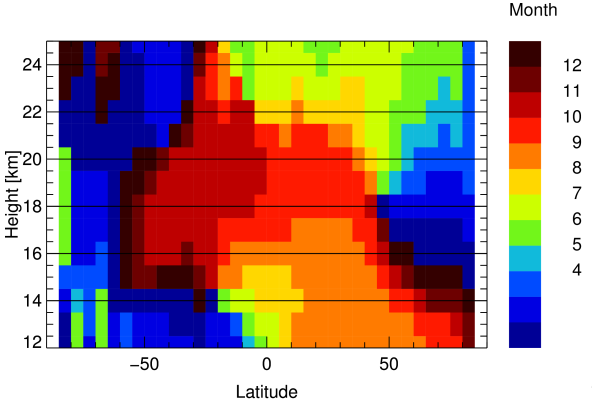
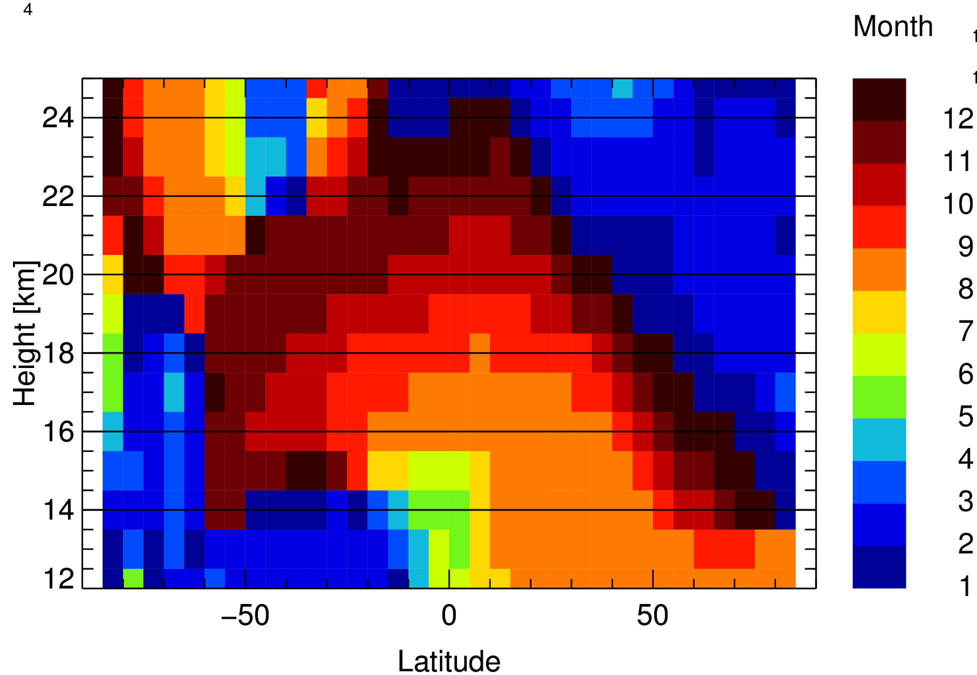
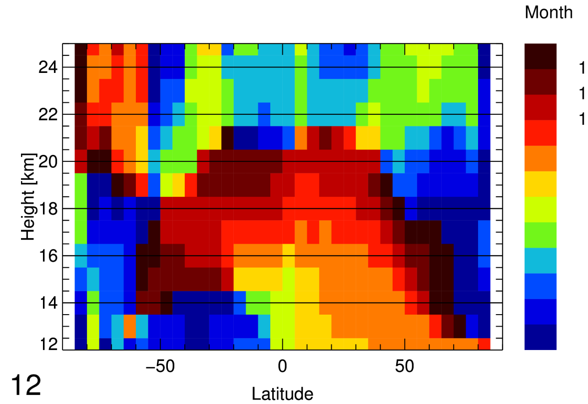


ECMWF EraInterim



H2O time series V4.2 every 8th day



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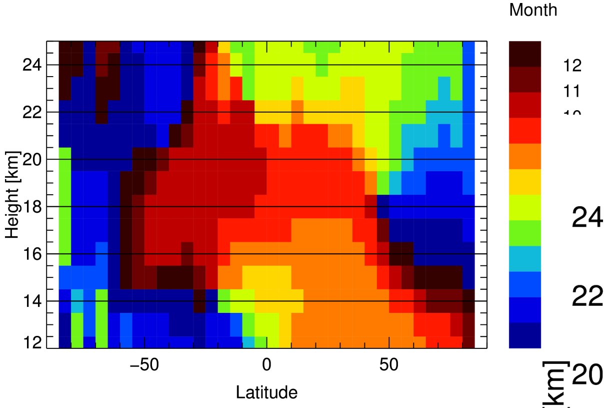
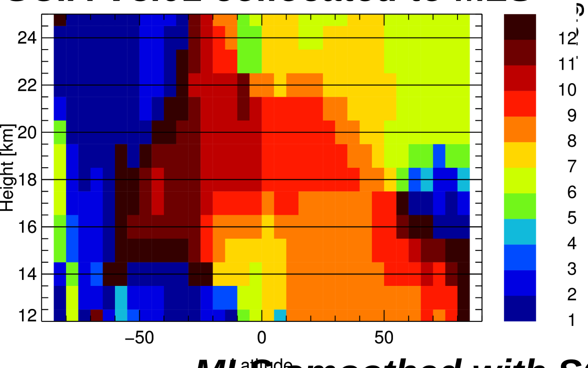
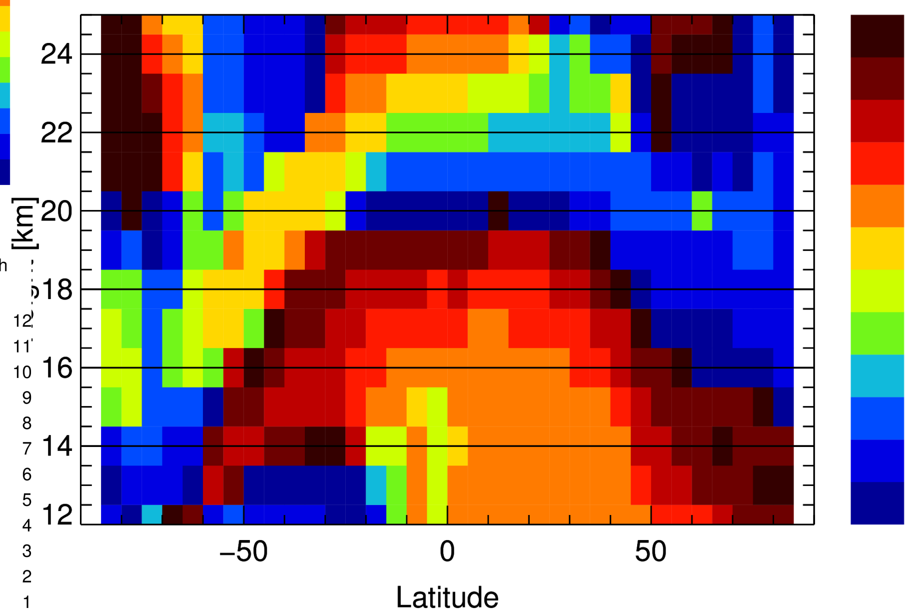


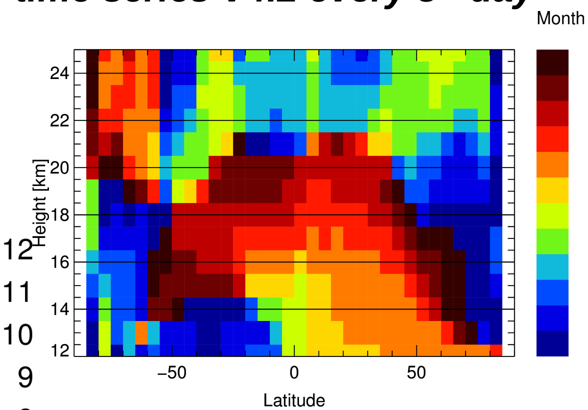
SCIA V3.01 collocated to MLS



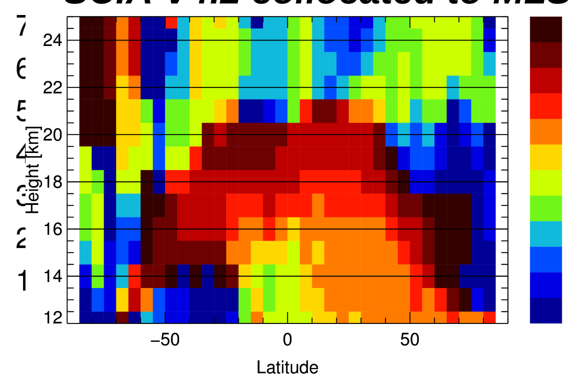
MLS collocated to SCIA V4.2



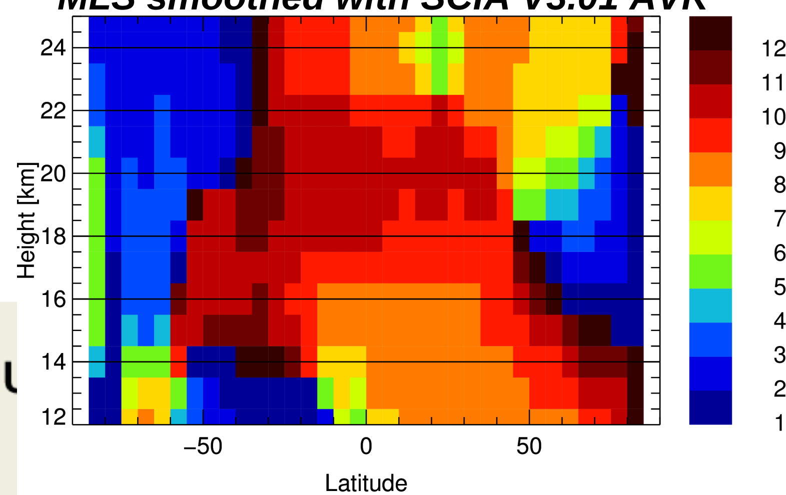
H2O time series V4.2 every 8th day



SCIA V4.2 collocated to MLS



MLS smoothed with SCIA V3.01 AVK



MLS smoothed with SCIA V4.2 AVK