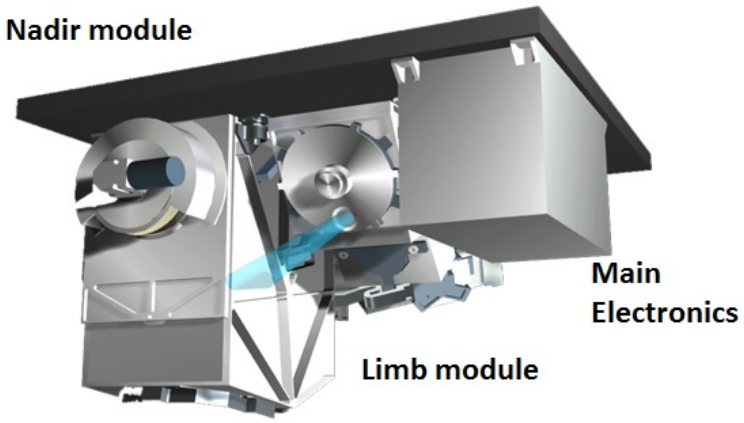
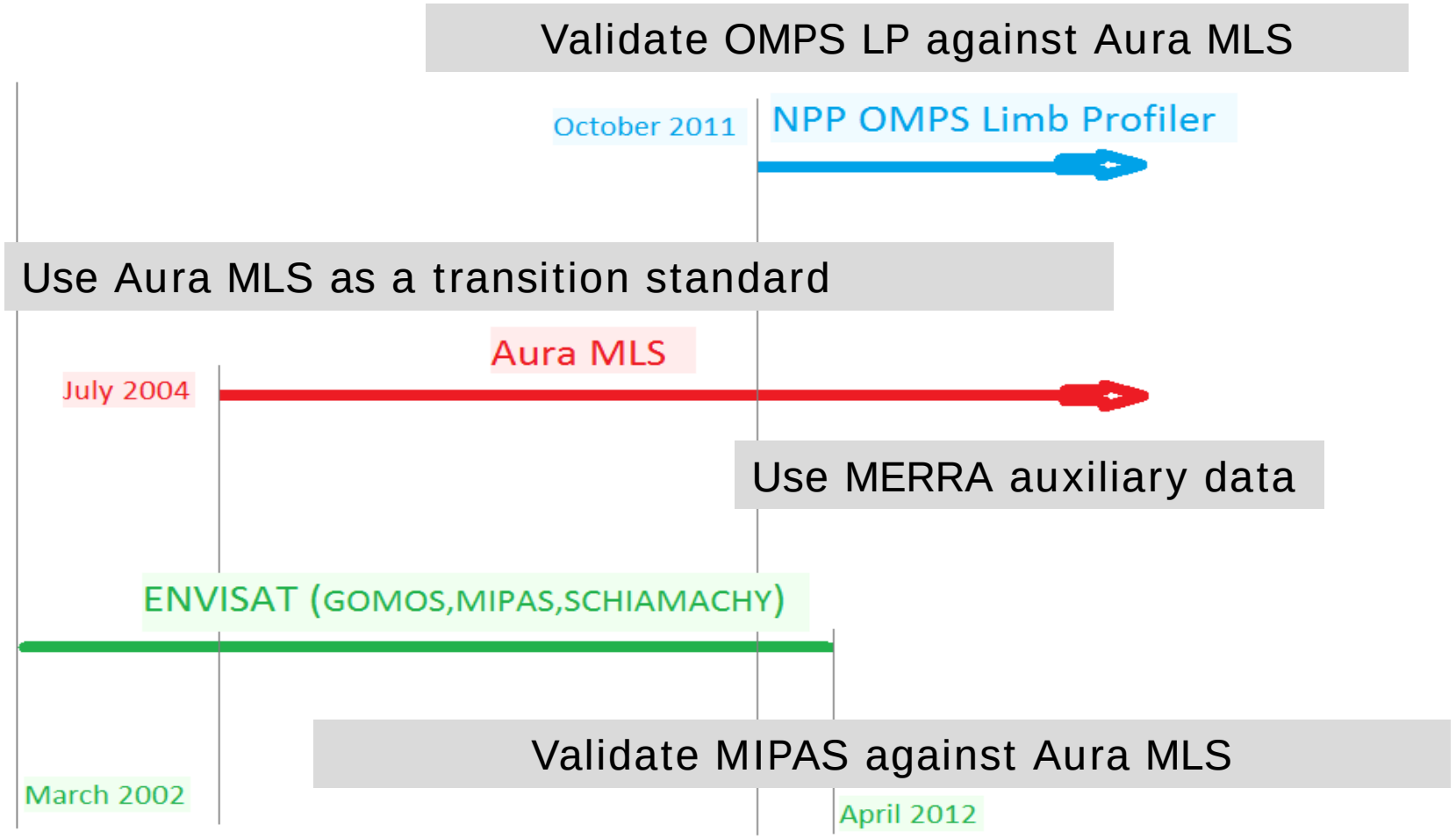
Continuation of GOMOS, MIPAS and SCIAMACHY-limb Ozone Record using OMPS Limb Profiler



Natalya Kramarova, P.K. Bhartia, Zhong Chen, Philippe Xu, and Matt DeLand

SUOMI NPP and ENVISAT



Methodology

MIPAS against MLS
January 2005 to March 2012

OMPS LP against MLS
April 2012 to May 2015

- Coincidence criteria: +- 2^0 latitude, +- 10^0 longitude, <500 km, daytime measurements only;
- Use LP data from the central slit only;
- Each MIPAS profile is interpolated on to the regular MLS pressure scale;
- Interpolation: a) LP on MLS pressure scale and b) MLS on regular LP altitude scale;
- Convert units using MERRA temperature and pressure profiles;
- For each day data are averaged in 5-degree latitude bins

Biases

MIPAS against MLS
January 2005 to March 2012

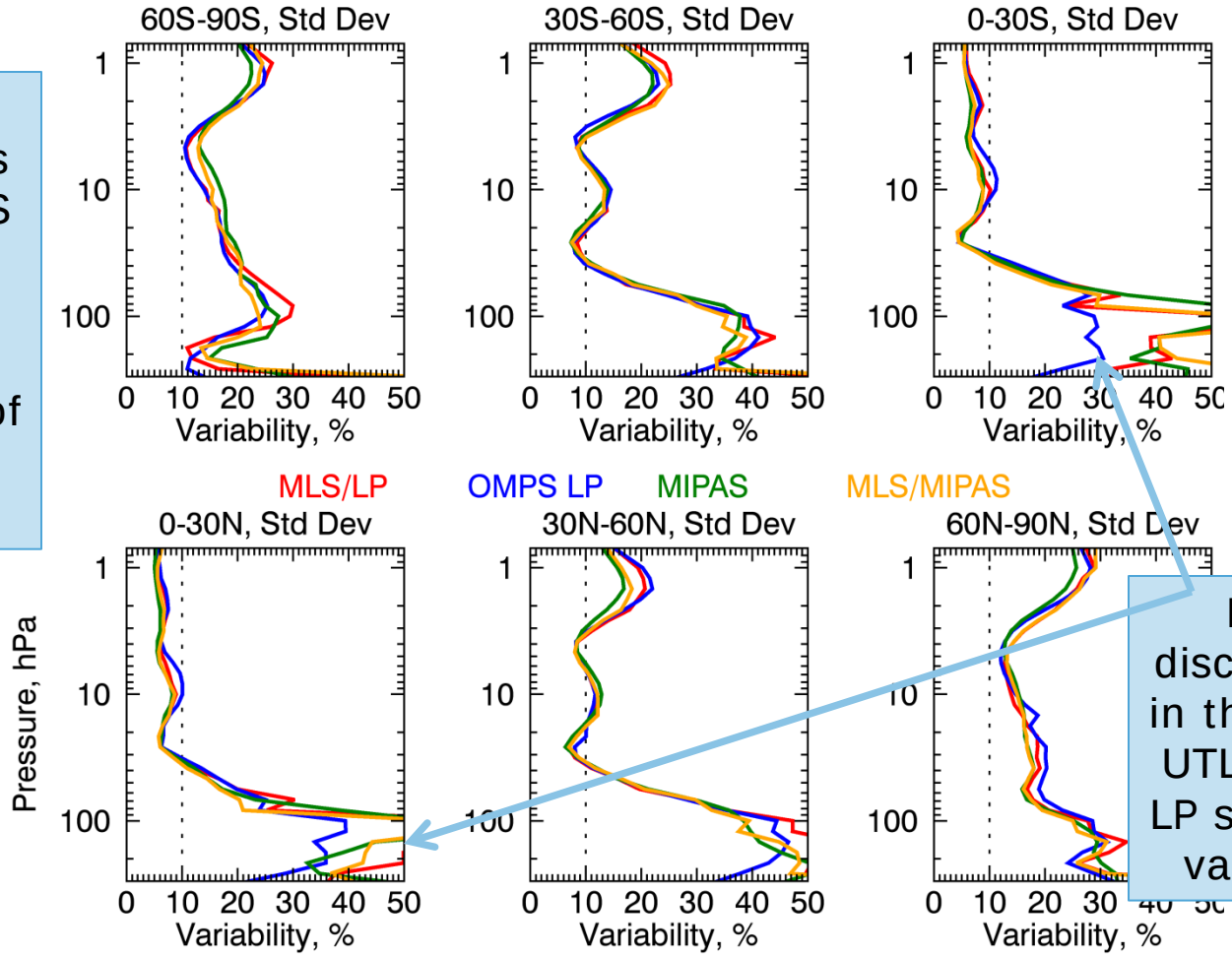
OMPS LP against MLS
April 2012 to May 2015

Biases are less then 10% (in many cases <5%) except for the tropical UTLS region and upper altitudes (above 56km);

See poster #14 “Validation of OMPS LP Ozone Profiles with Satellite, Ozonesonde and Lidar Measurements” by Ghassan Taha

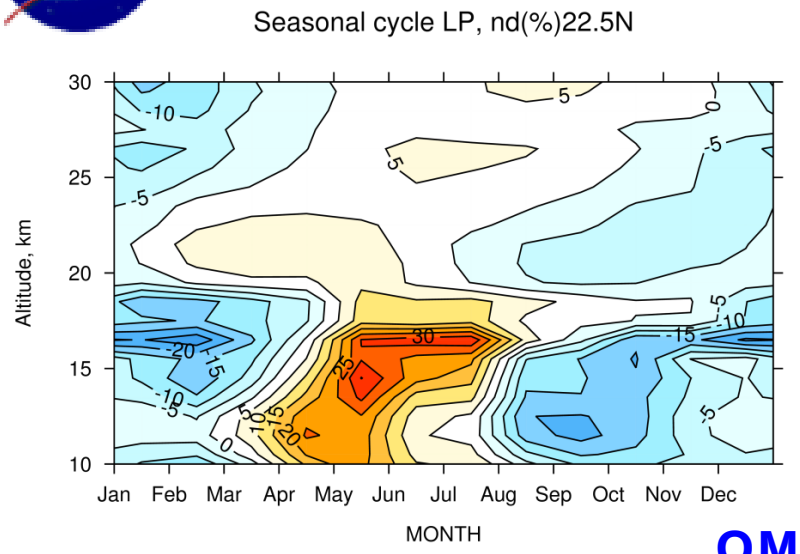
Ozone variability

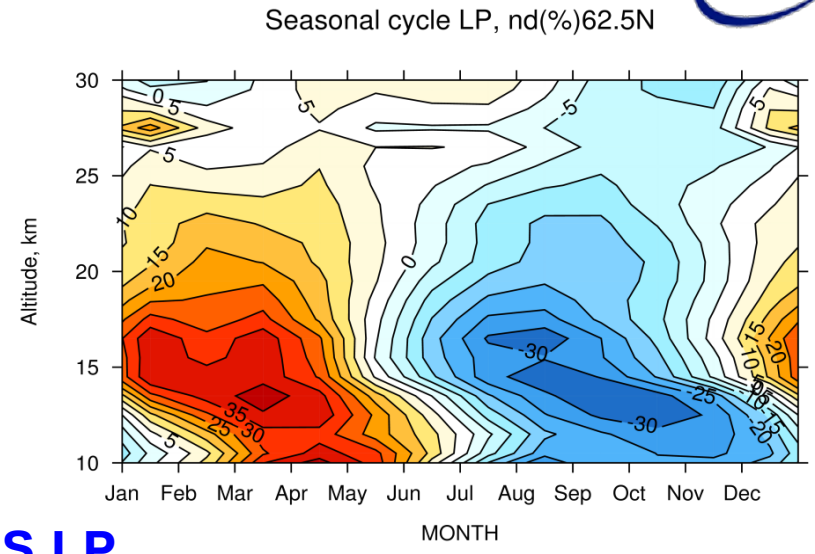
All three instruments (MIPAS,MLS and OMPS LP) agree well in estimation of ozone variability



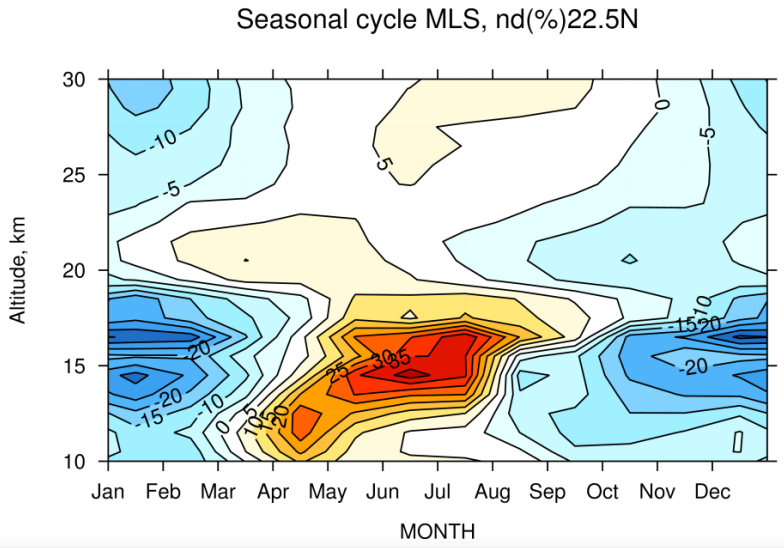
Larger discrepancies in the tropical UTLS (OMPS LP shows less variability)

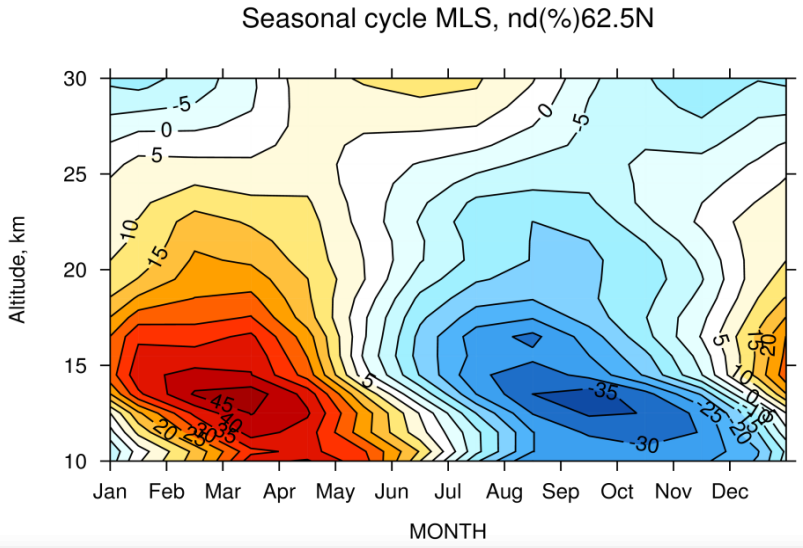
Seasonal ozone variability: OMPS LP and MLS





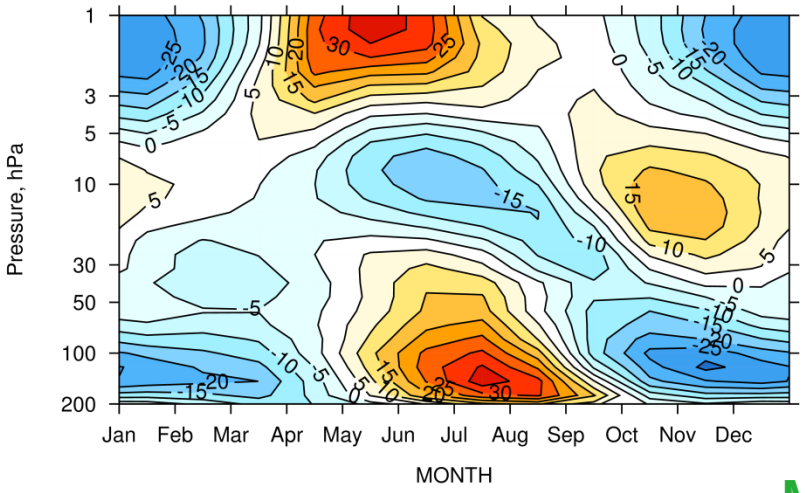
OMPS LP



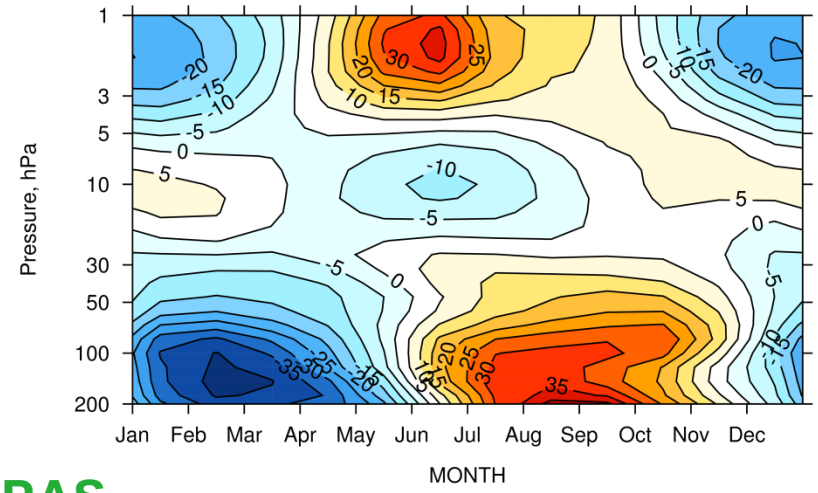


Seasonal ozone variability: MIPAS and MLS

Seasonal cycle MIPAS, nd(%),62.5S

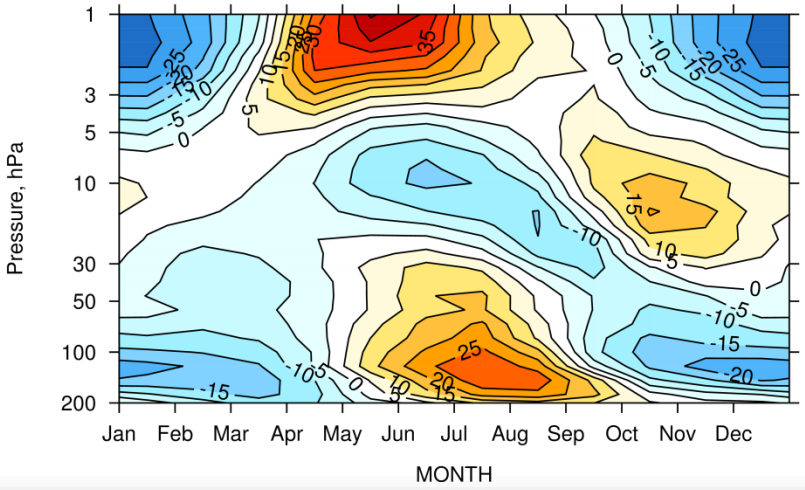


Seasonal cycle MIPAS, nd(%)42.5S

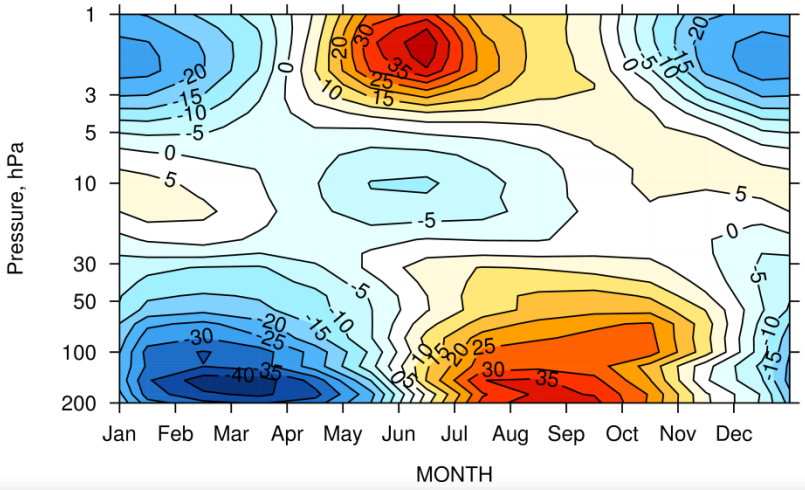


MIPAS

Seasonal cycle MLS, nd(%)62.5S

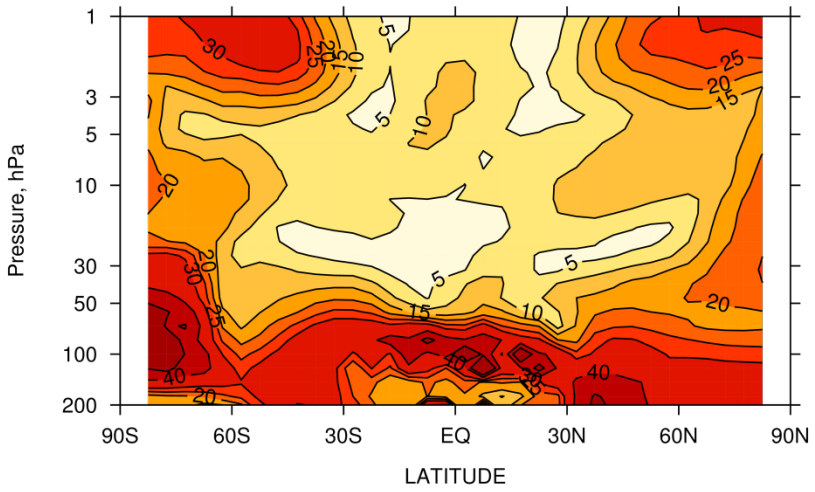


Seasonal cycle MLS, nd(%)42.5S

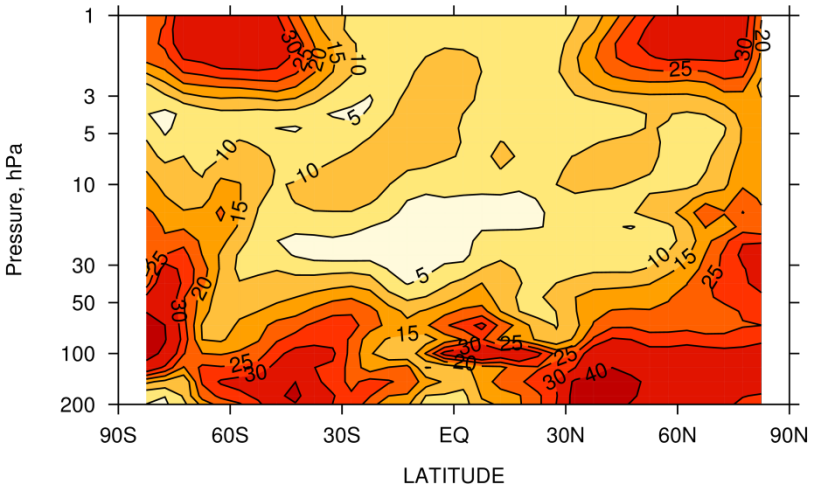


Ozone seasonal cycle: MIPAS, Aura MLS and OMPS LP

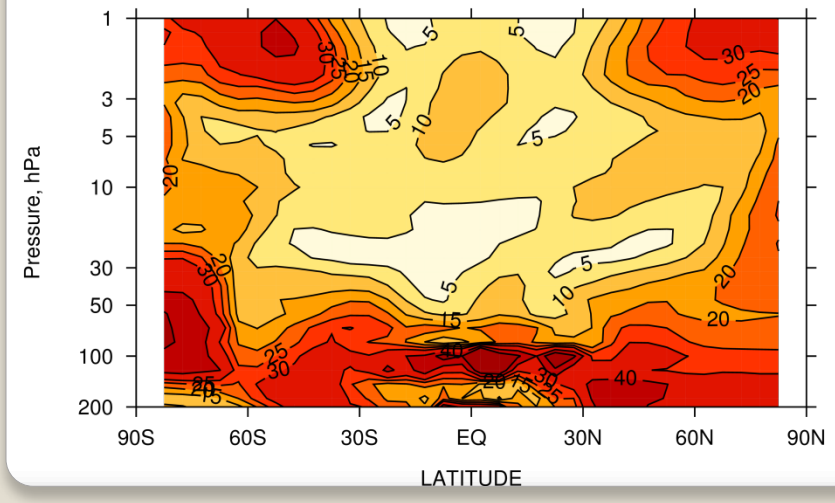
Amplitude of the Seasonal cycle MIPAS, nd(%)



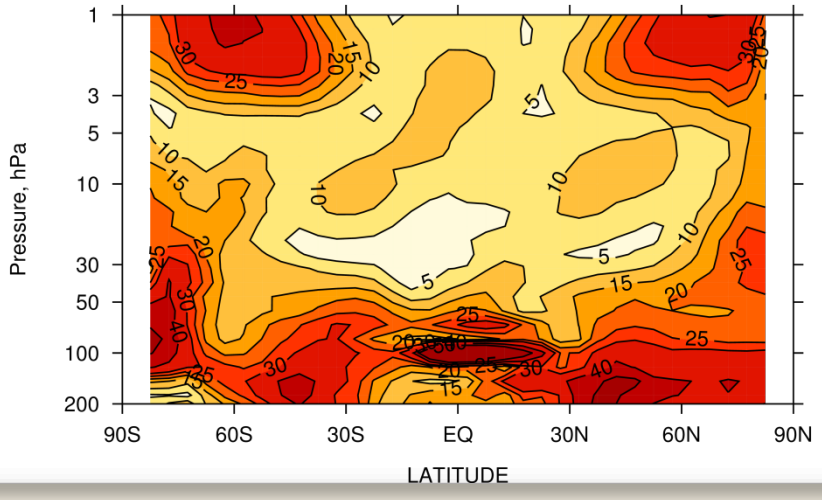
Amplitude of the Seasonal cycle LP, nd(%)



Amplitude of the Seasonal cycle MLS, nd(%)

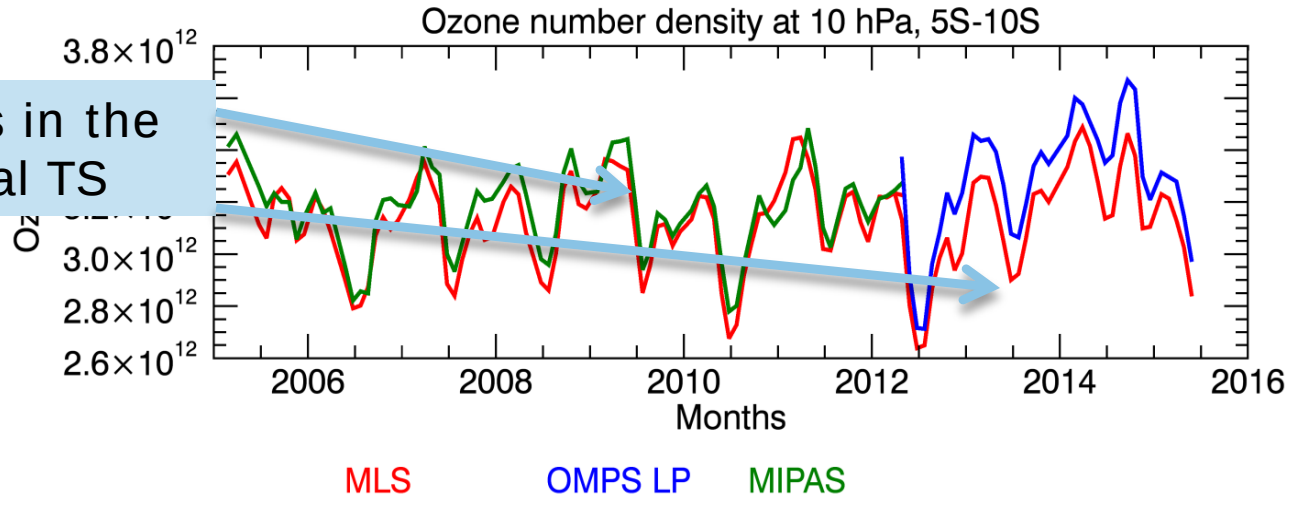


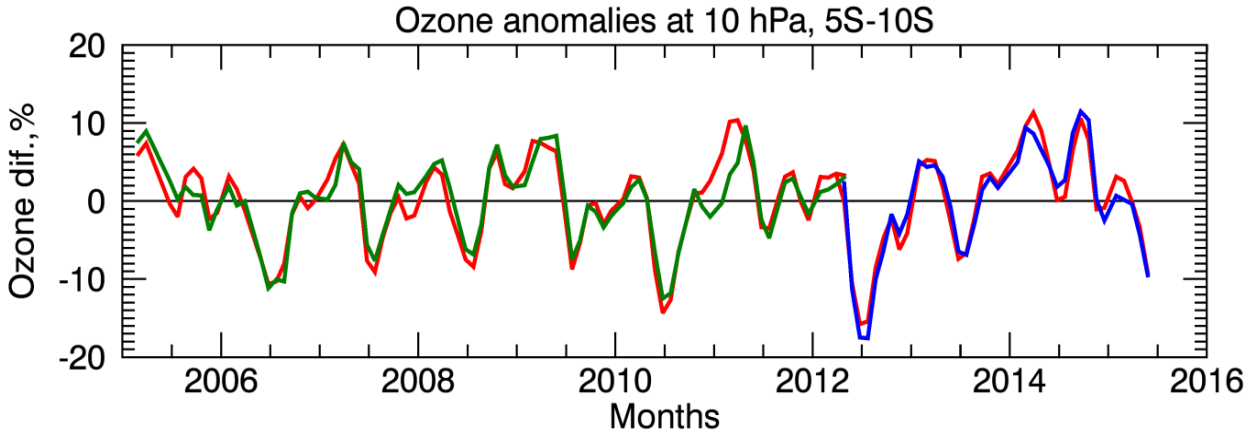
Amplitude of the Seasonal cycle MLS, nd(%)



Ozone time series

Biases in the original TS





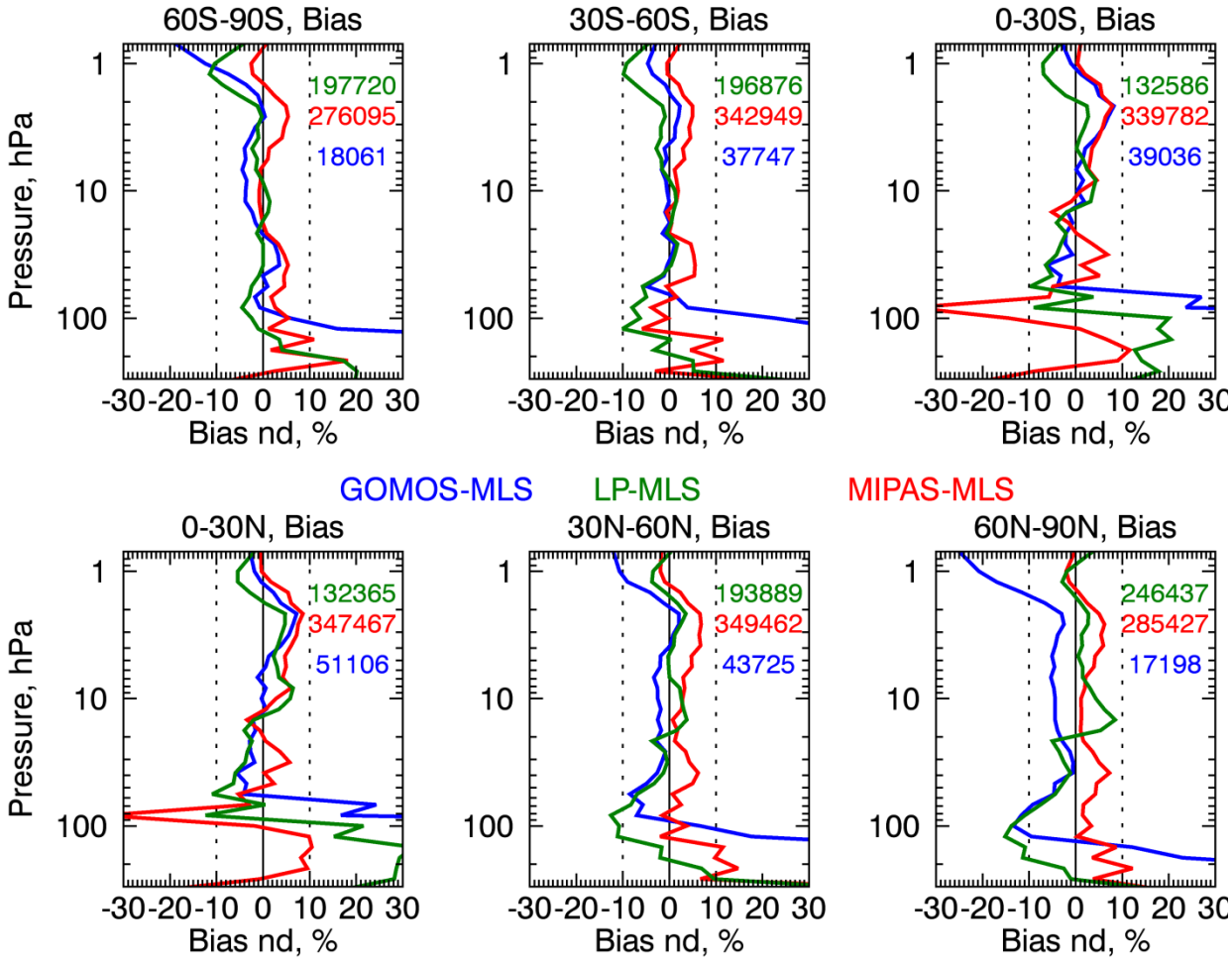
CONCLUSIONS

- We found that all three instruments agree well in estimation of the ozone variability (seasonal cycle, QBO), except for the tropical UTLS region;
- Presented results show that OMPS LP can be used to extend ENVISAT ozone profile record to create an independent dataset for long-term ozone trend analysis;
- Open questions: quality of auxiliary (temperature and pressure) data, coordinate system (vmr vs pressure or nd vs altitude), diurnal variations.

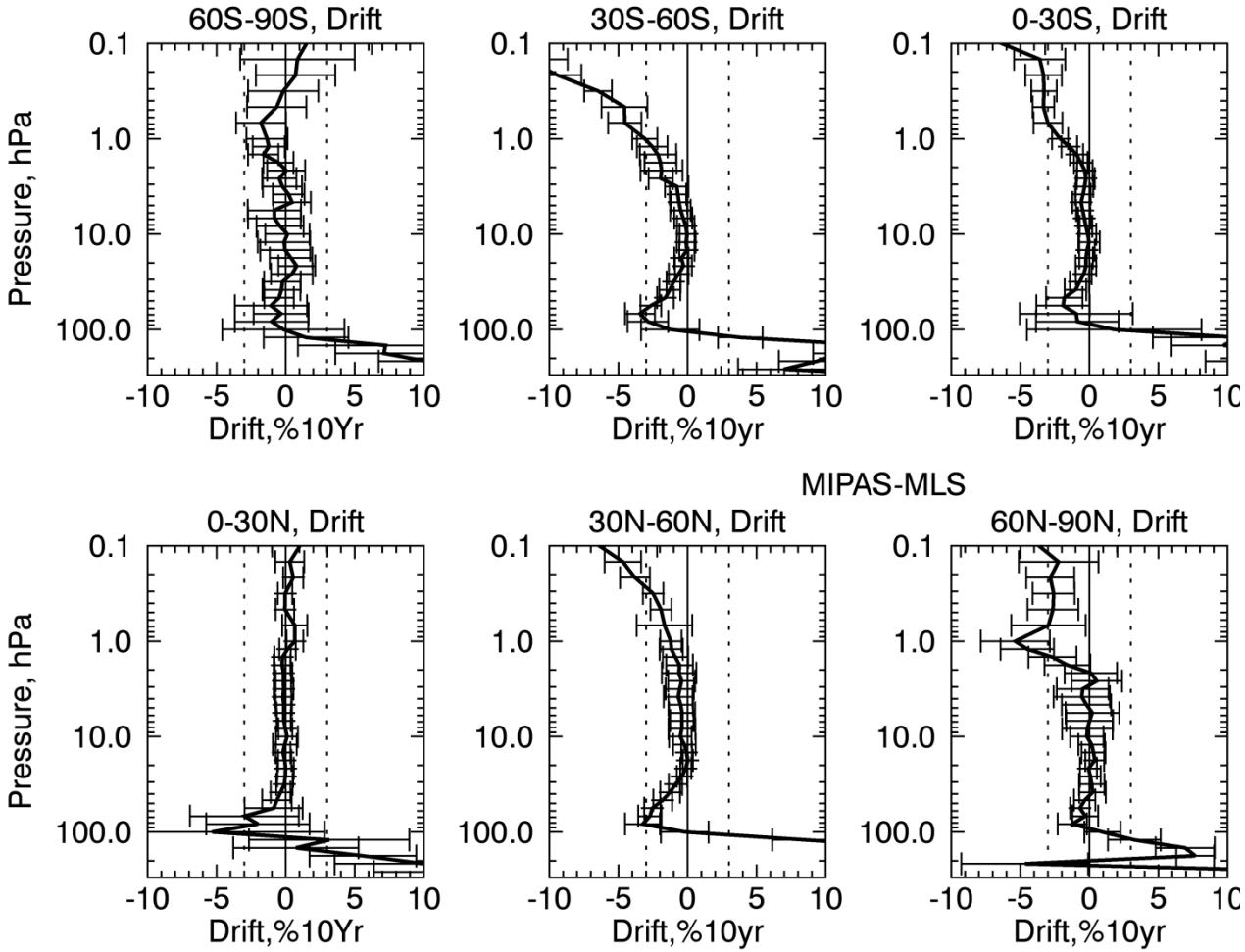
OMPS LP data are available at http://ozoneaq.gsfc.nasa.gov/omps

Back-up slides

Biases: MIPAS and LP against Aura MLS



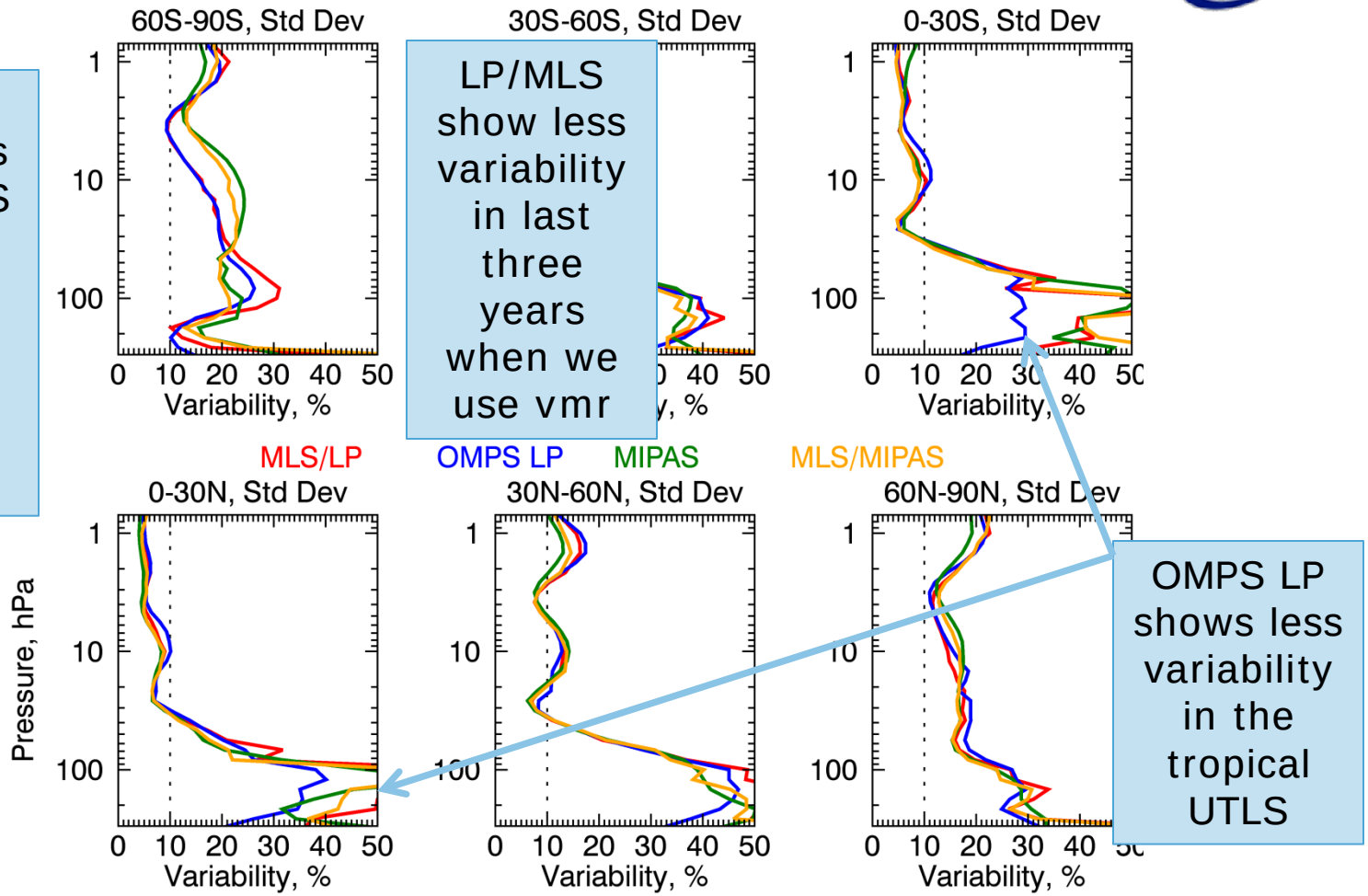
Relative drift: MIPAS against Aura MLS



Ozone variability

All three instruments (MIPAS,MLS and OMPS LP) agree well in estimating ozone variability

LP/MLS show less variability in last three years when we use vmr



OMPS LP shows less variability in the tropical UTLS