



SAGE III/ISS and SAGE II ozone against ground-based long term records

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And

Koji Miyagawa, Allen Jordan, Eliane Millard-Barras

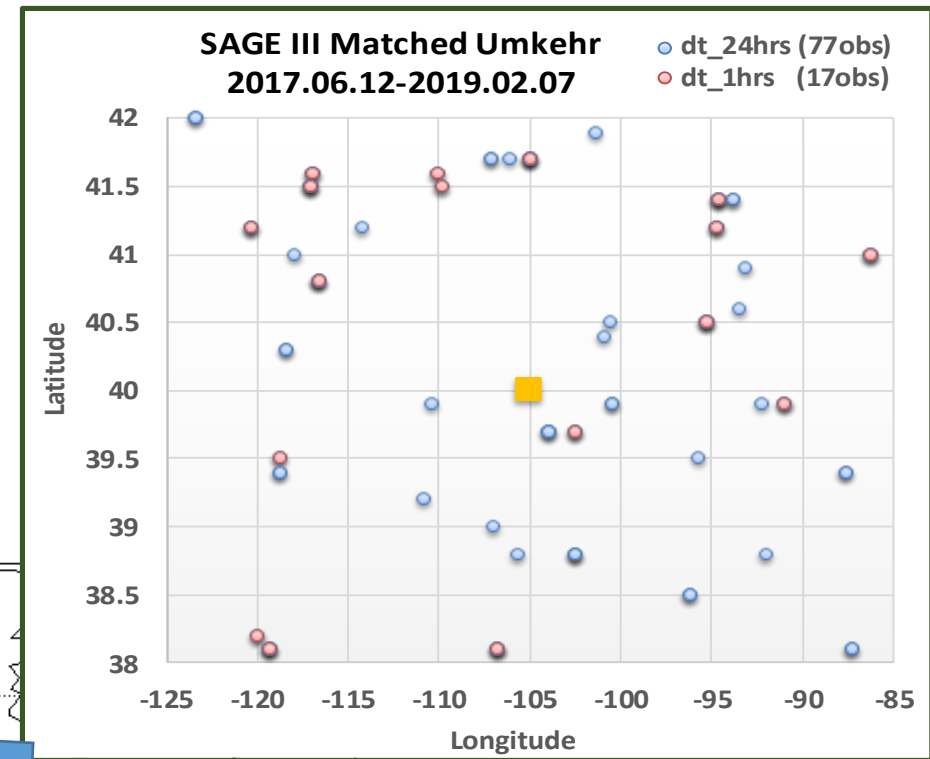
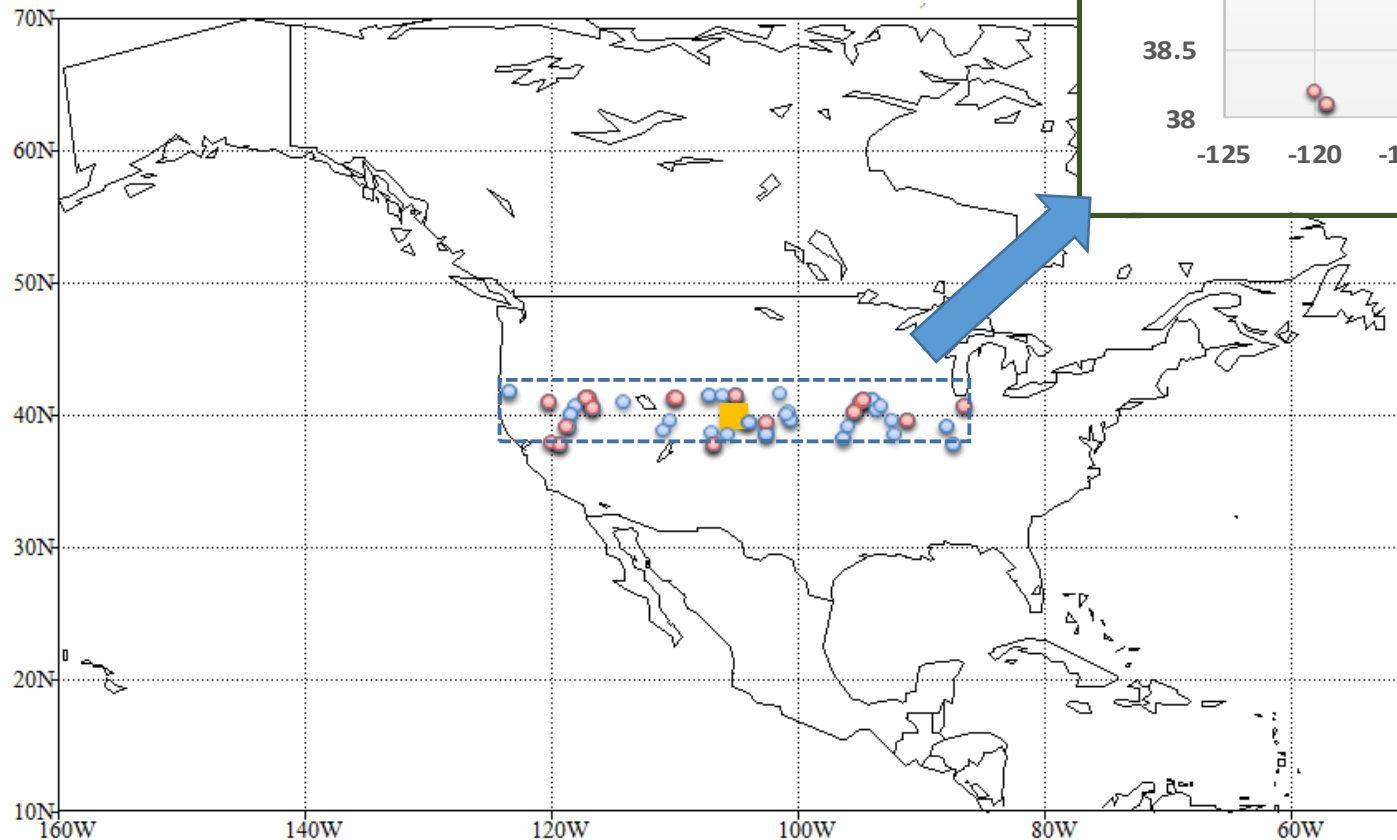


Matching criteria

Time: +/- 24 hrs , +/-1 h

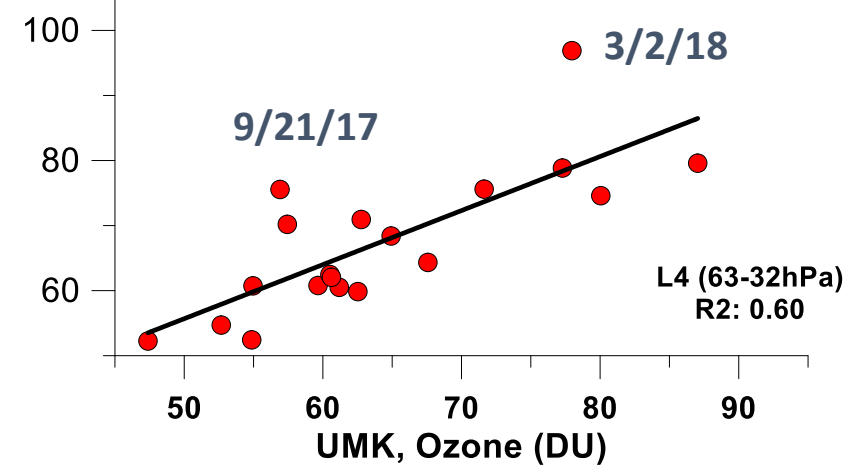
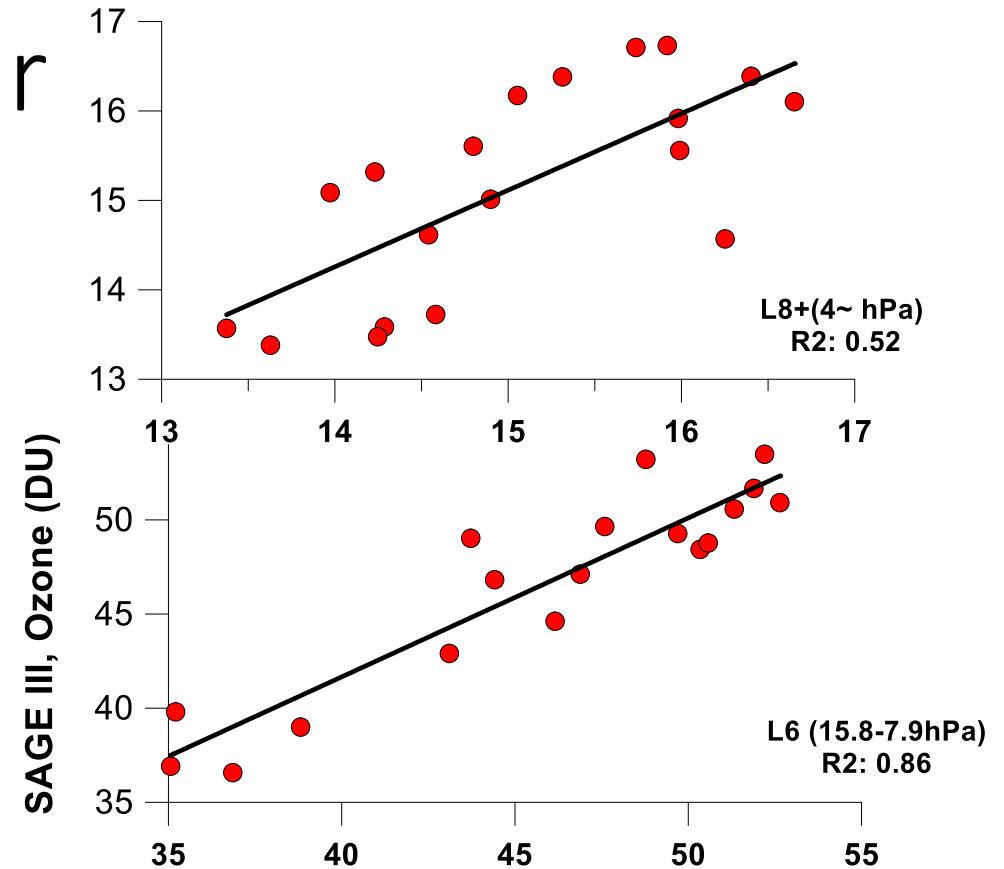
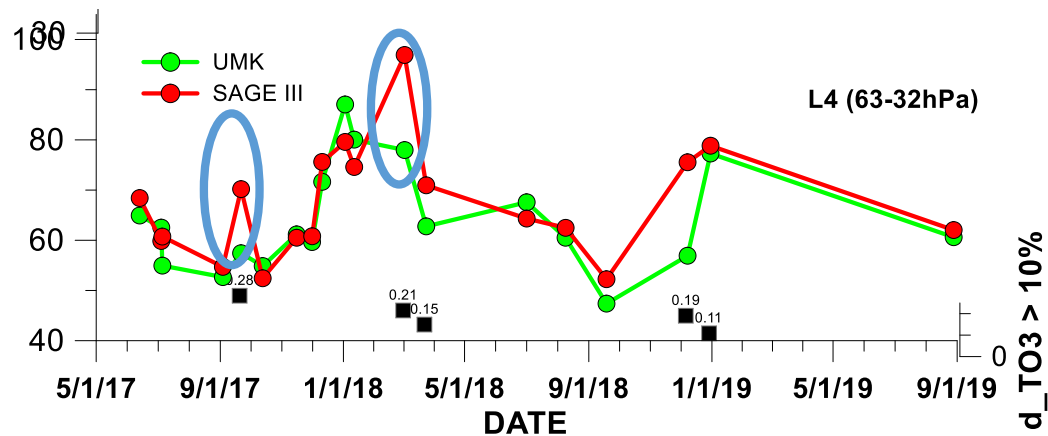
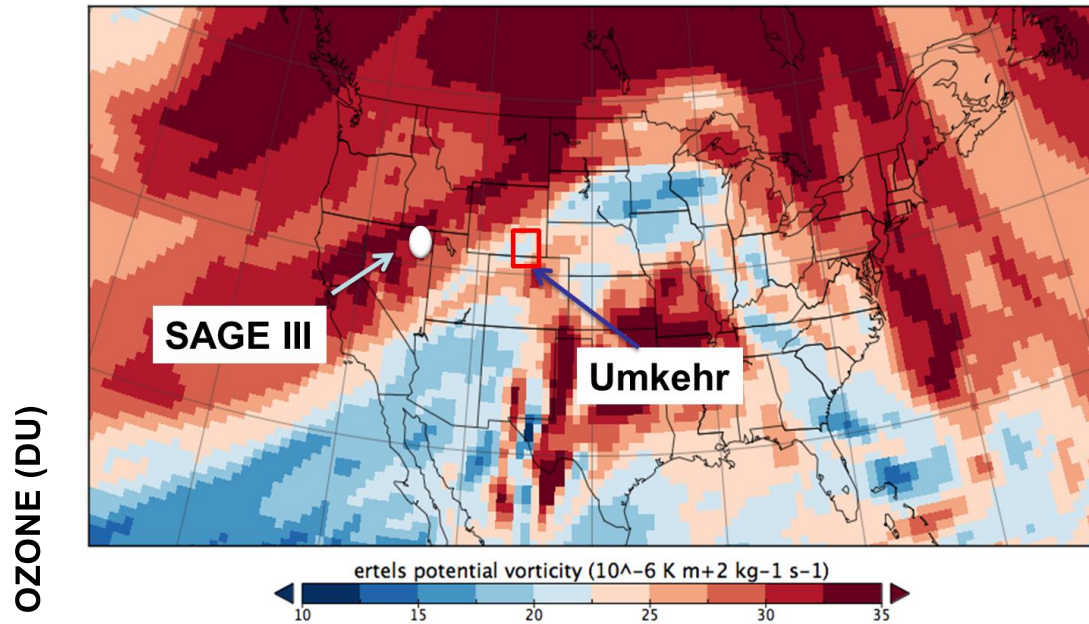
Latitude: +/- 2 degree, ~200 km

Longitude: +/- 20 degree (+/- 3 degrees), ~2000 km



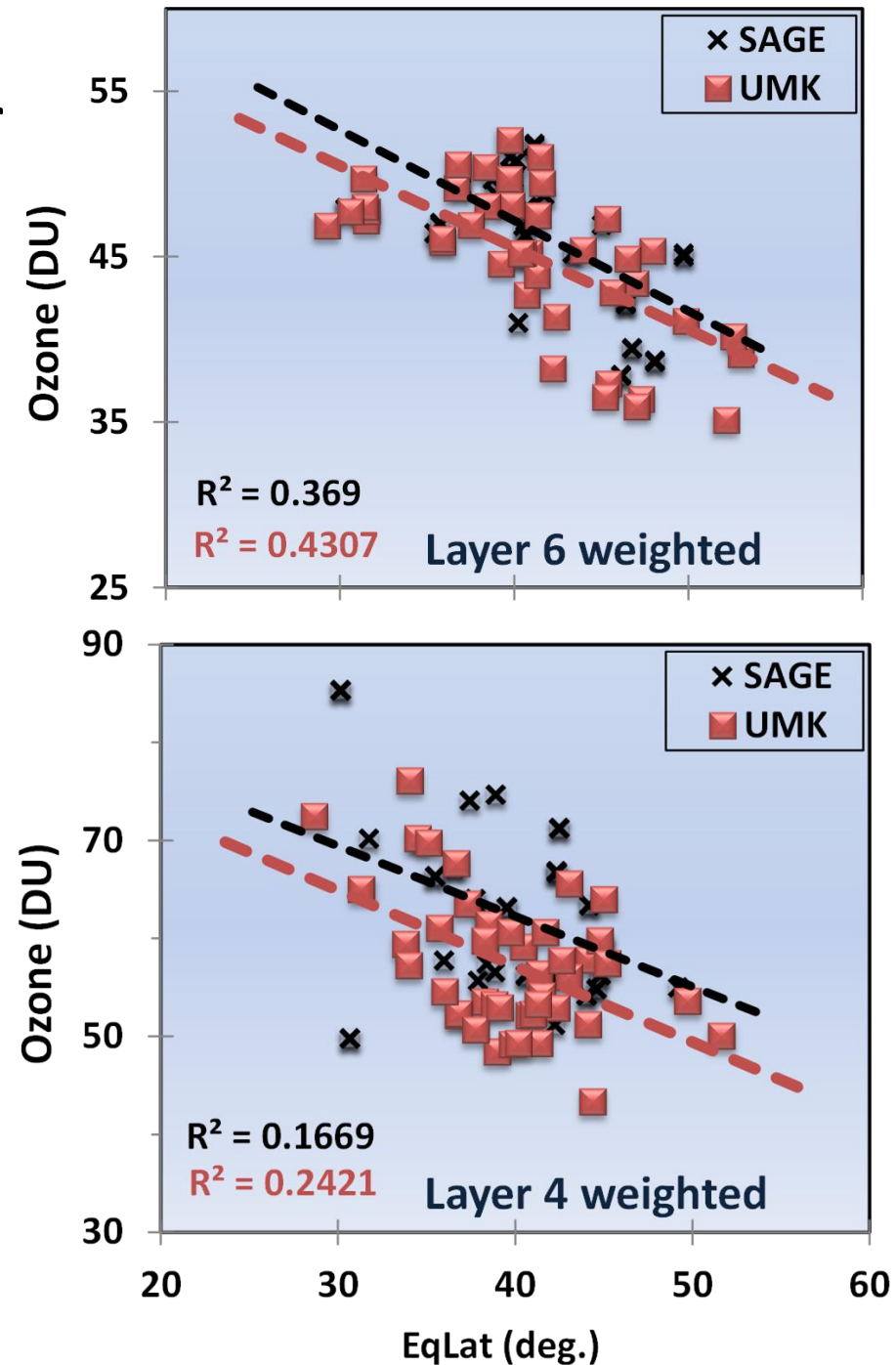
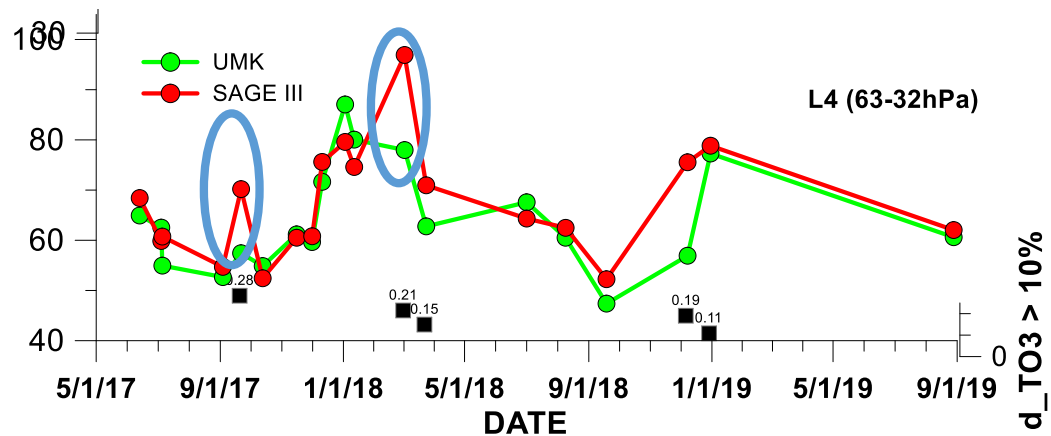
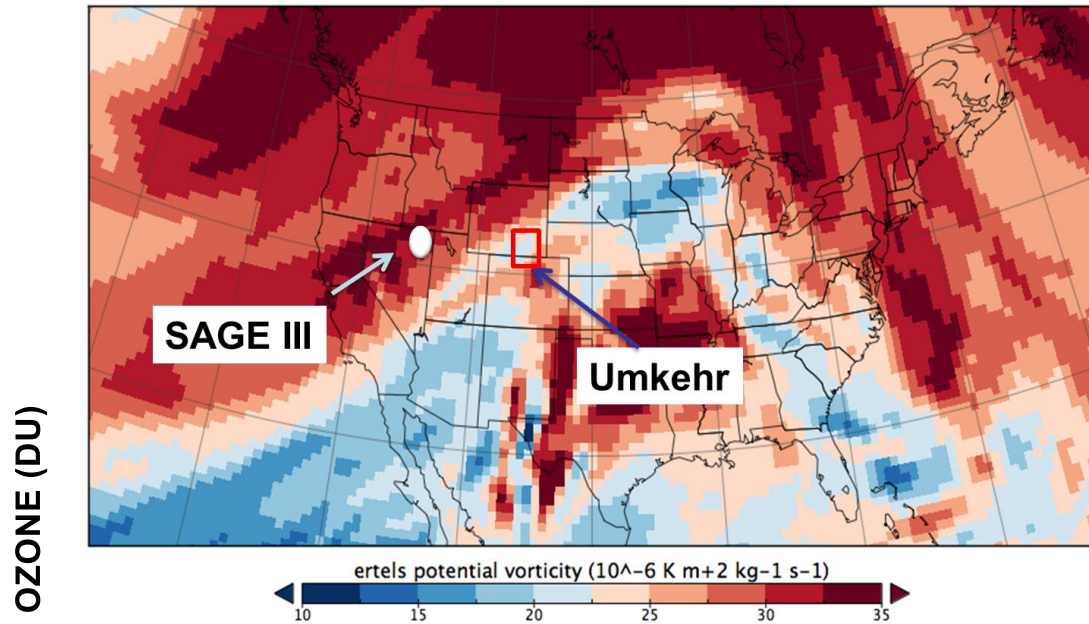
SAGE III/ISS and Umkehr

PV at 50 hPa: 2018-03-02 00:00:00



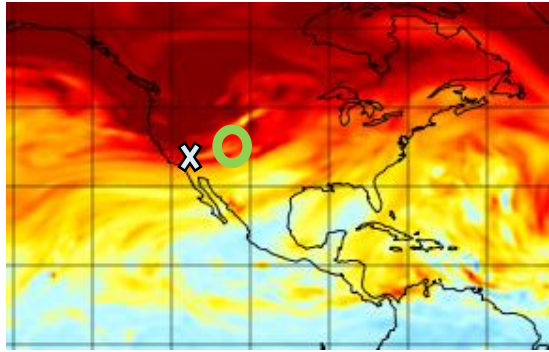
SAGE III/ISS and Umkehr

PV at 50 hPa: 2018-03-02 00:00:00

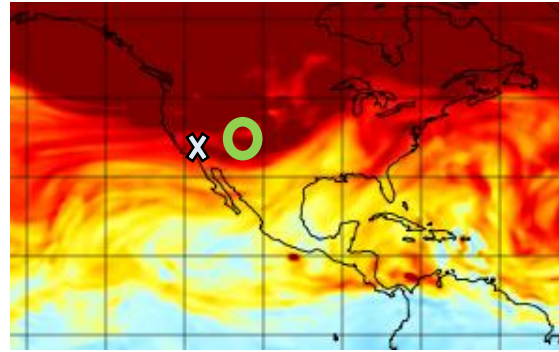


Potential Vorticity

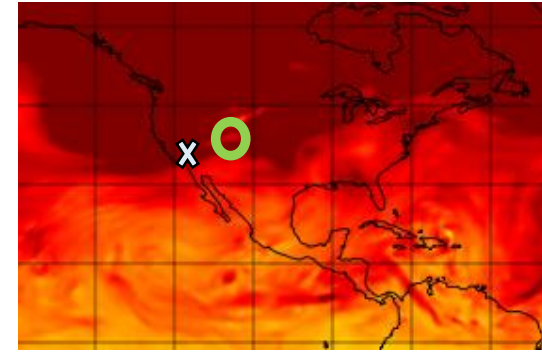
2017-09-19 15UTC 100hPa



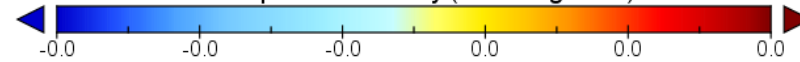
2017-09-20 15UTC 100hPa



2017-09-21 15UTC 100hPa



ertels potential vorticity ($\text{K m}^2 \text{kg}^{-1} \text{s}^{-1}$)

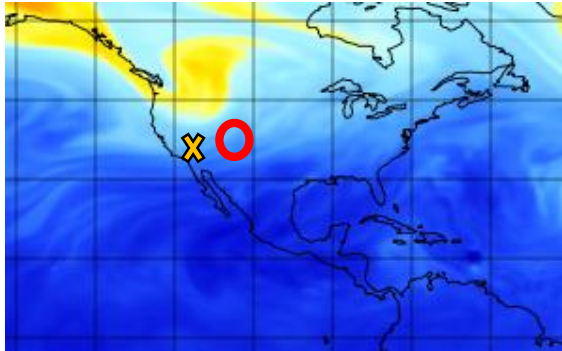


X SAGEIII O BDR

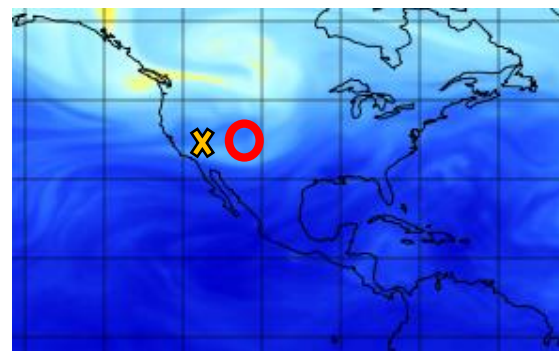
PV – from MERRA2

Ozone mass Mixing ratio

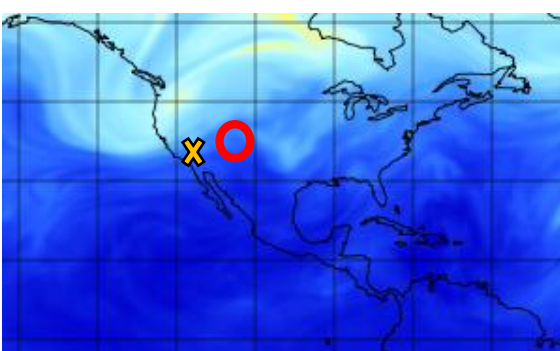
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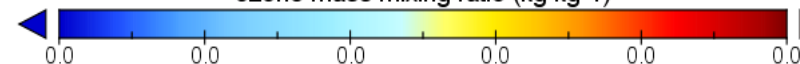
2017-09-20 15UTC 100hPa



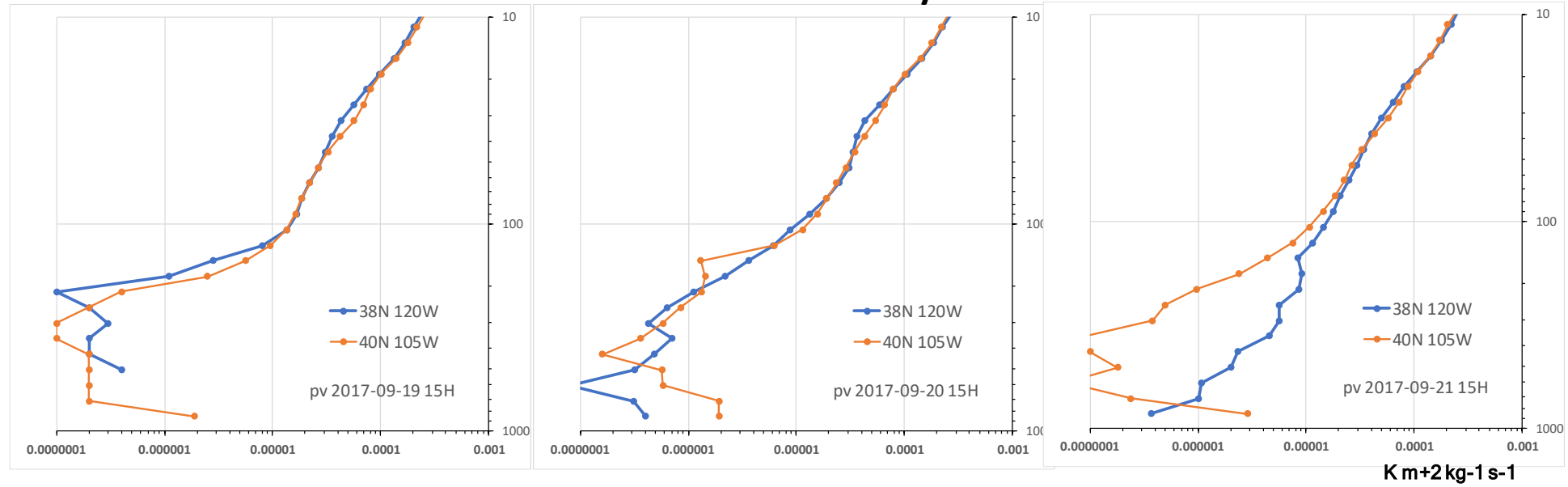
2017-09-21 15UTC 100hPa



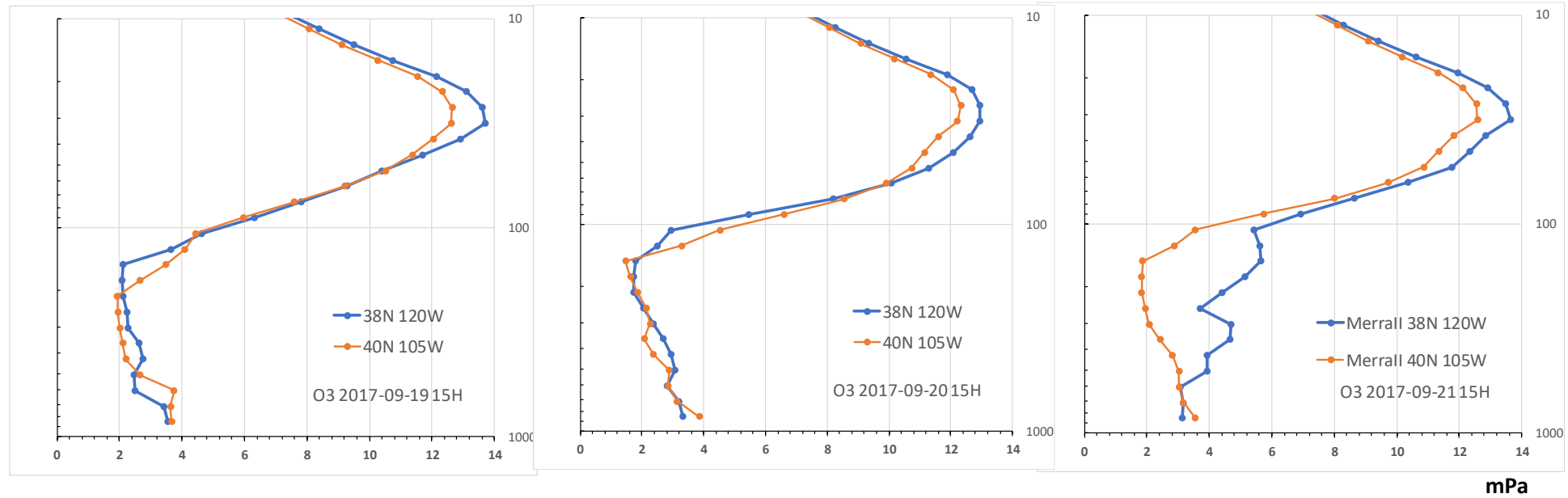
ozone mass mixing ratio (kg kg^{-1})



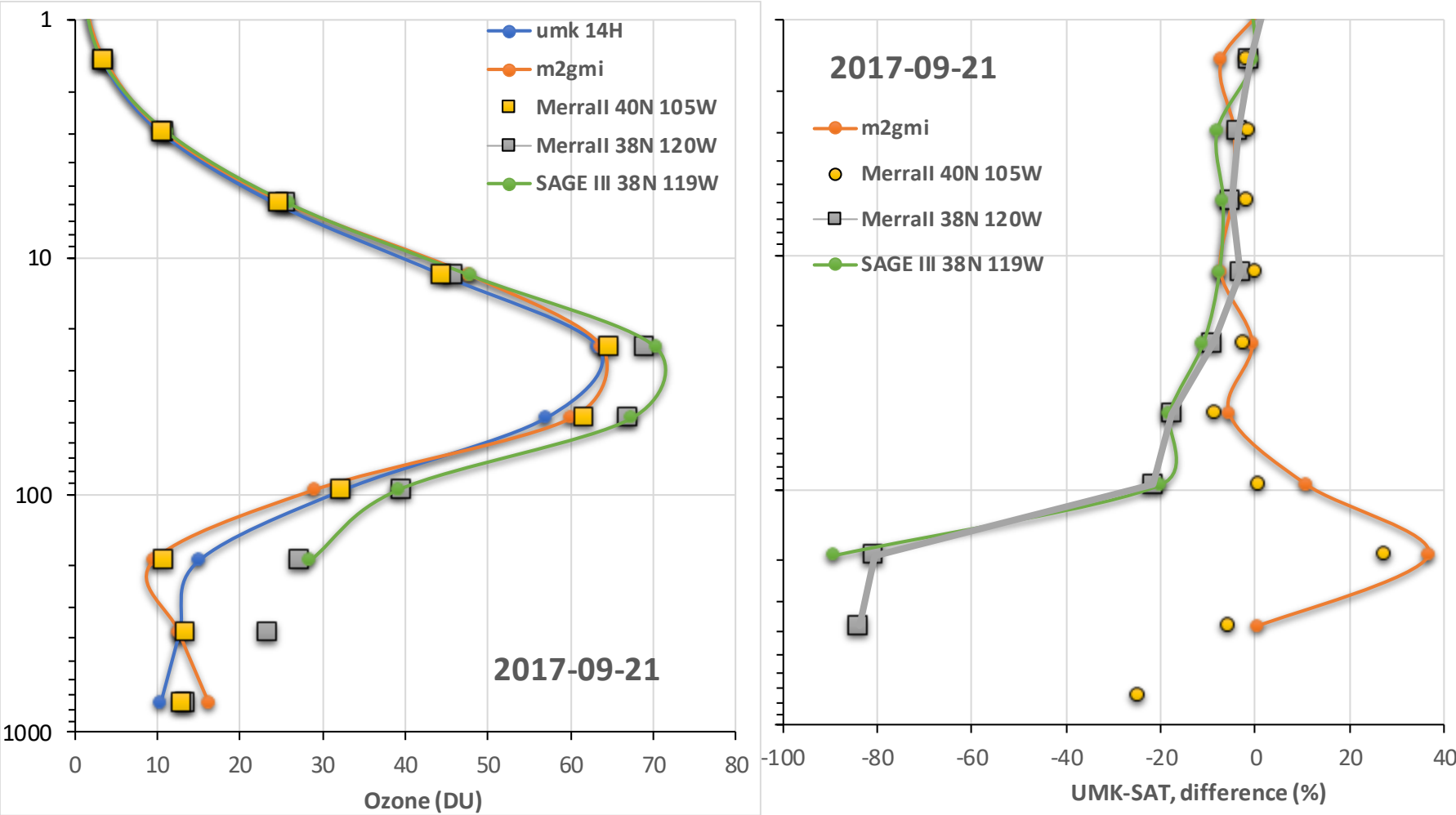
Potential Vorticity



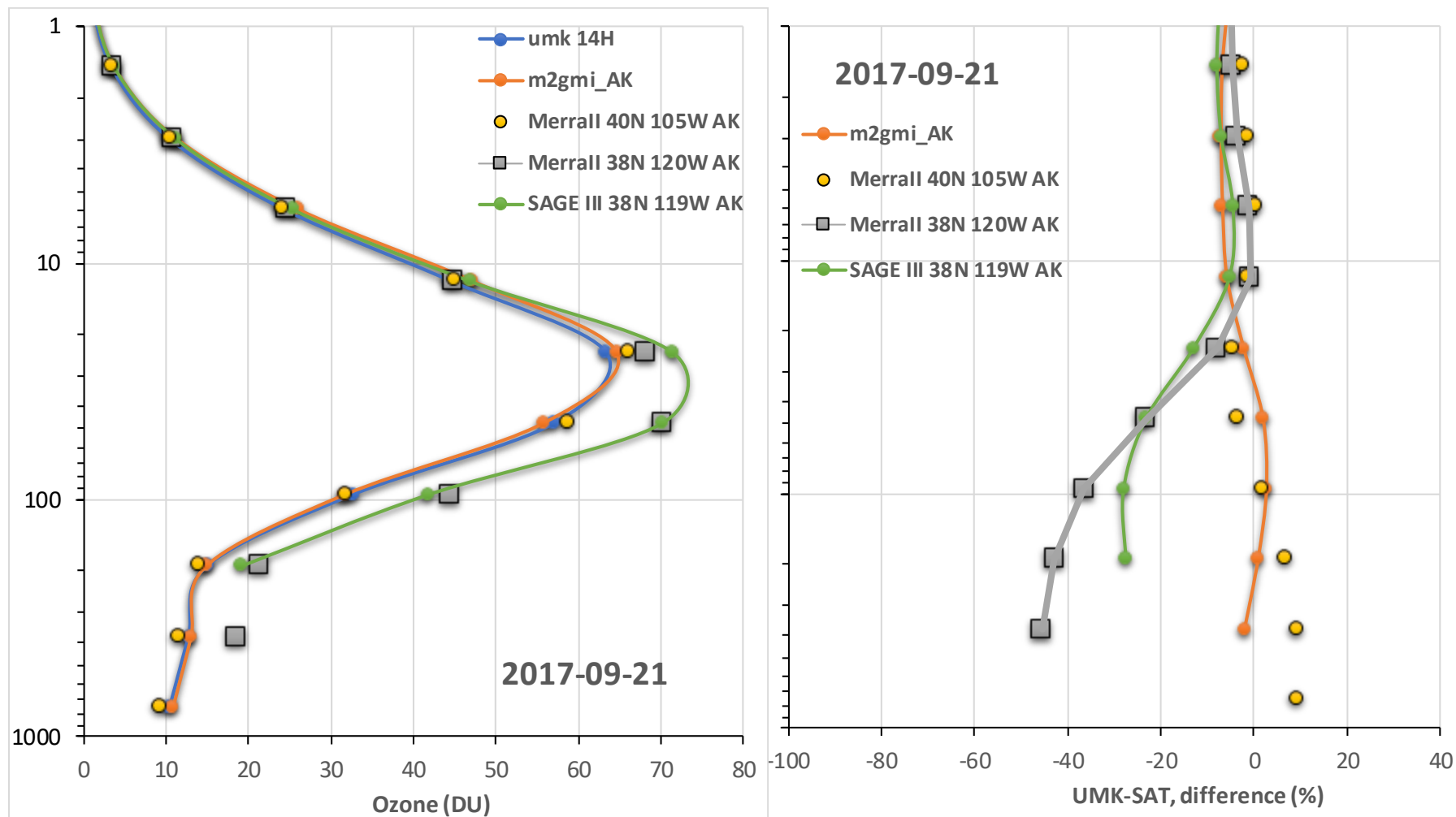
Ozone



Without smoothing

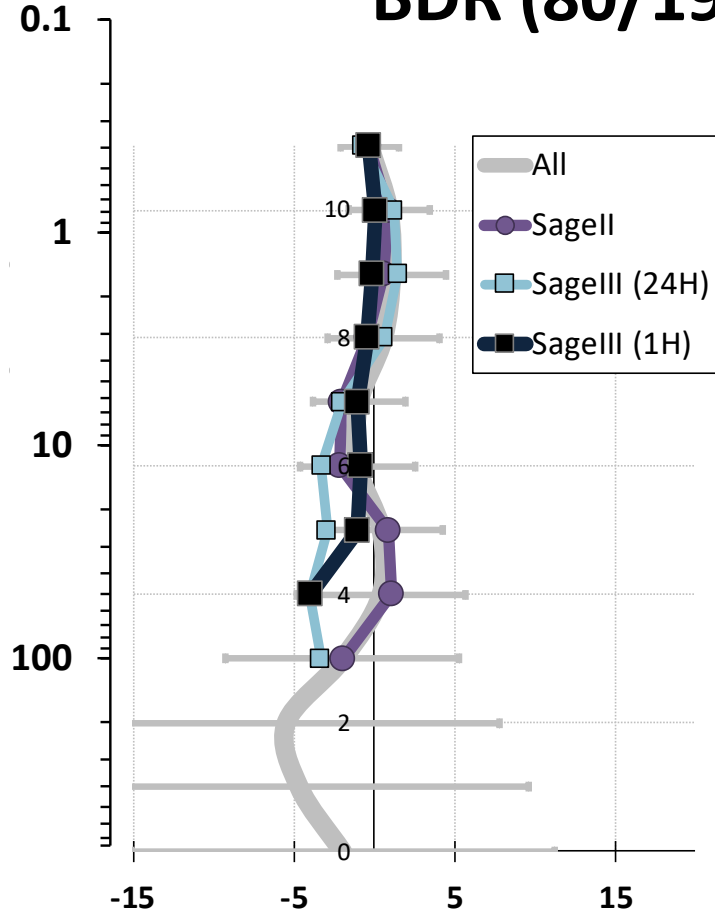


Umkehr smoothing applied, AK



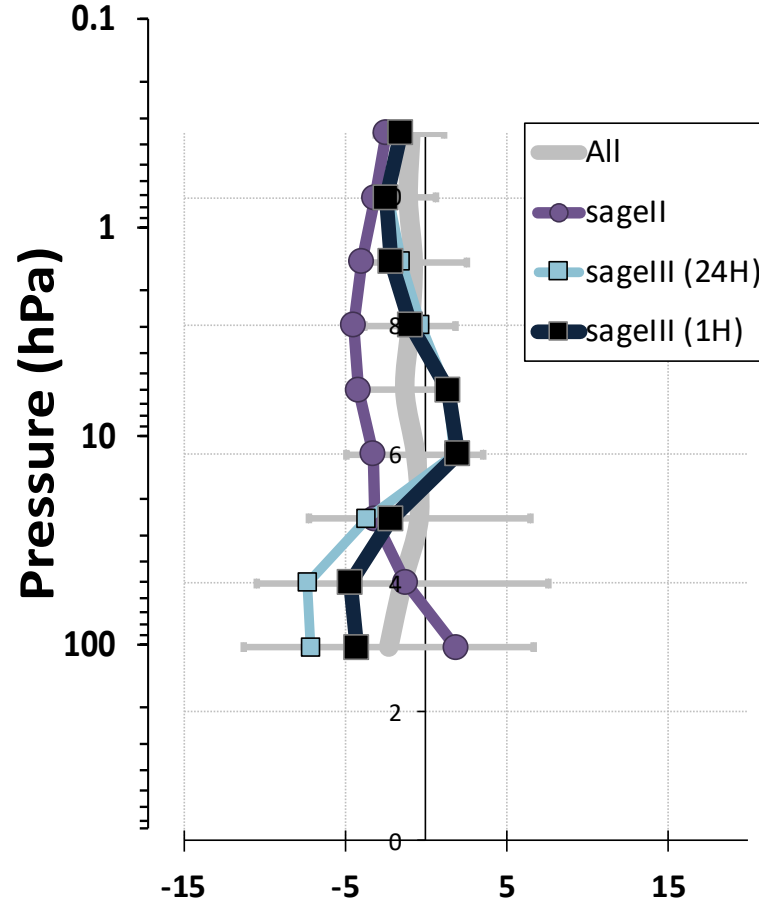
SAGE II (1985-2005), SAGE III/ISS (2017-2019)
UMK (SLC and Optimized)
All (Other satellites and ozonesonde averages, S.D.)

BDR (80/19)

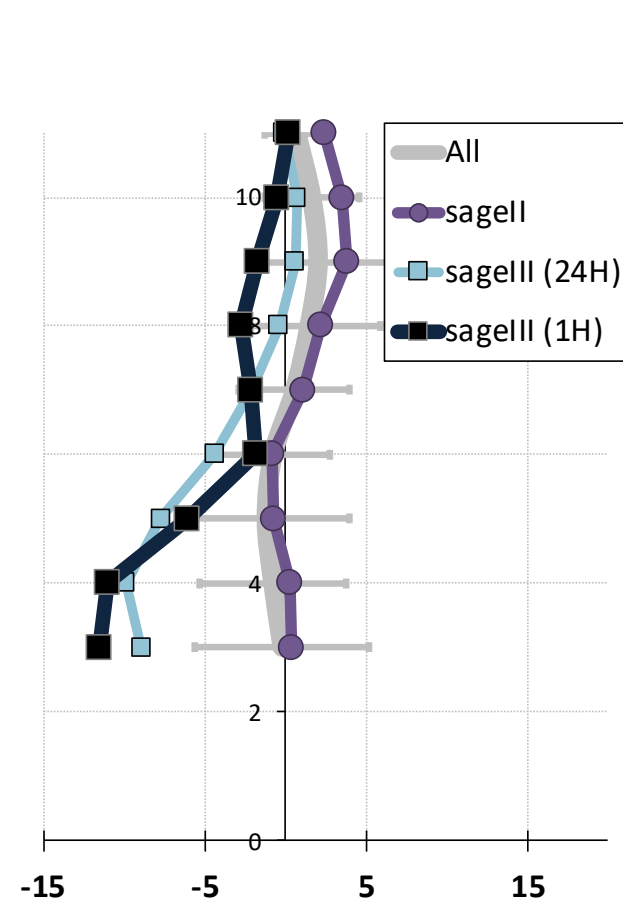


UMK-SAGE, % difference

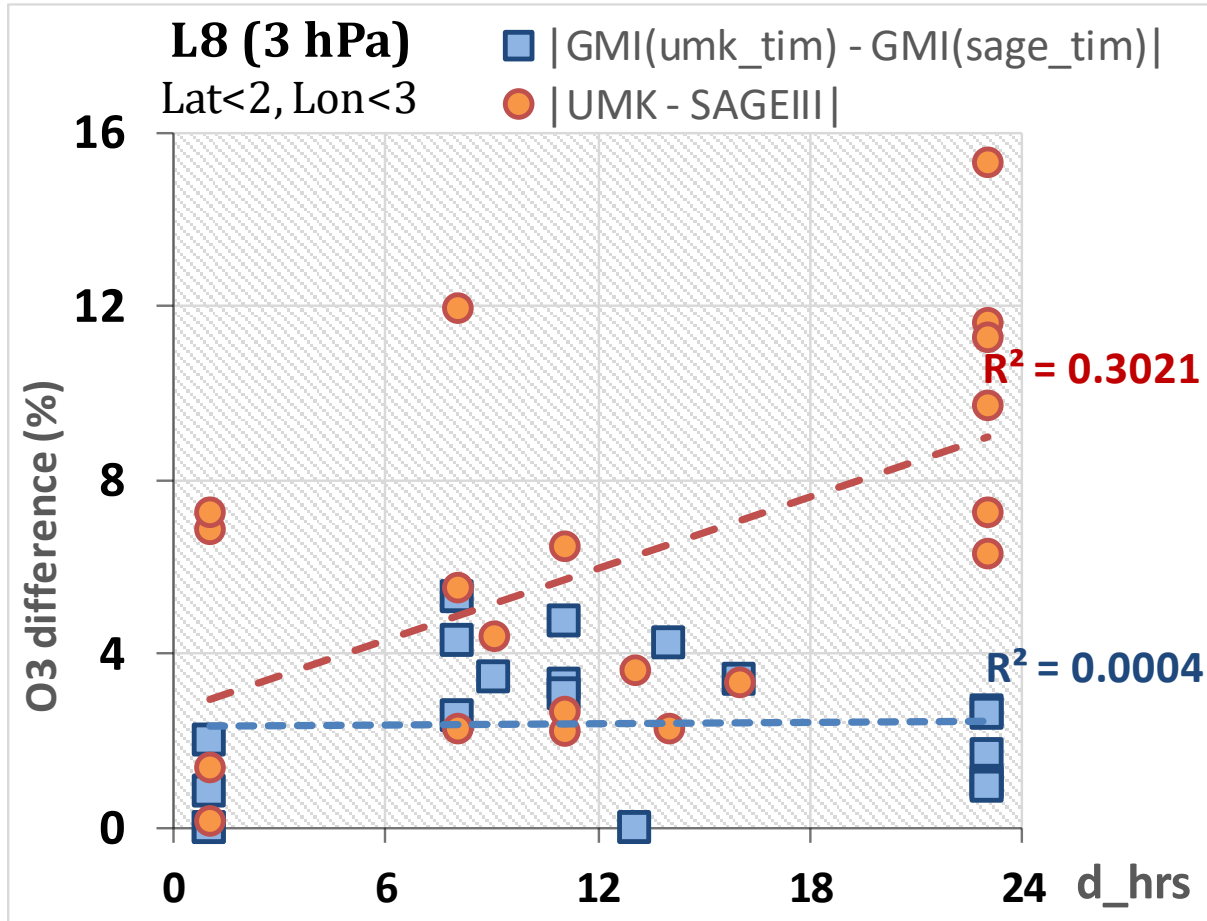
MLO (44/10)



LDR (41/11)



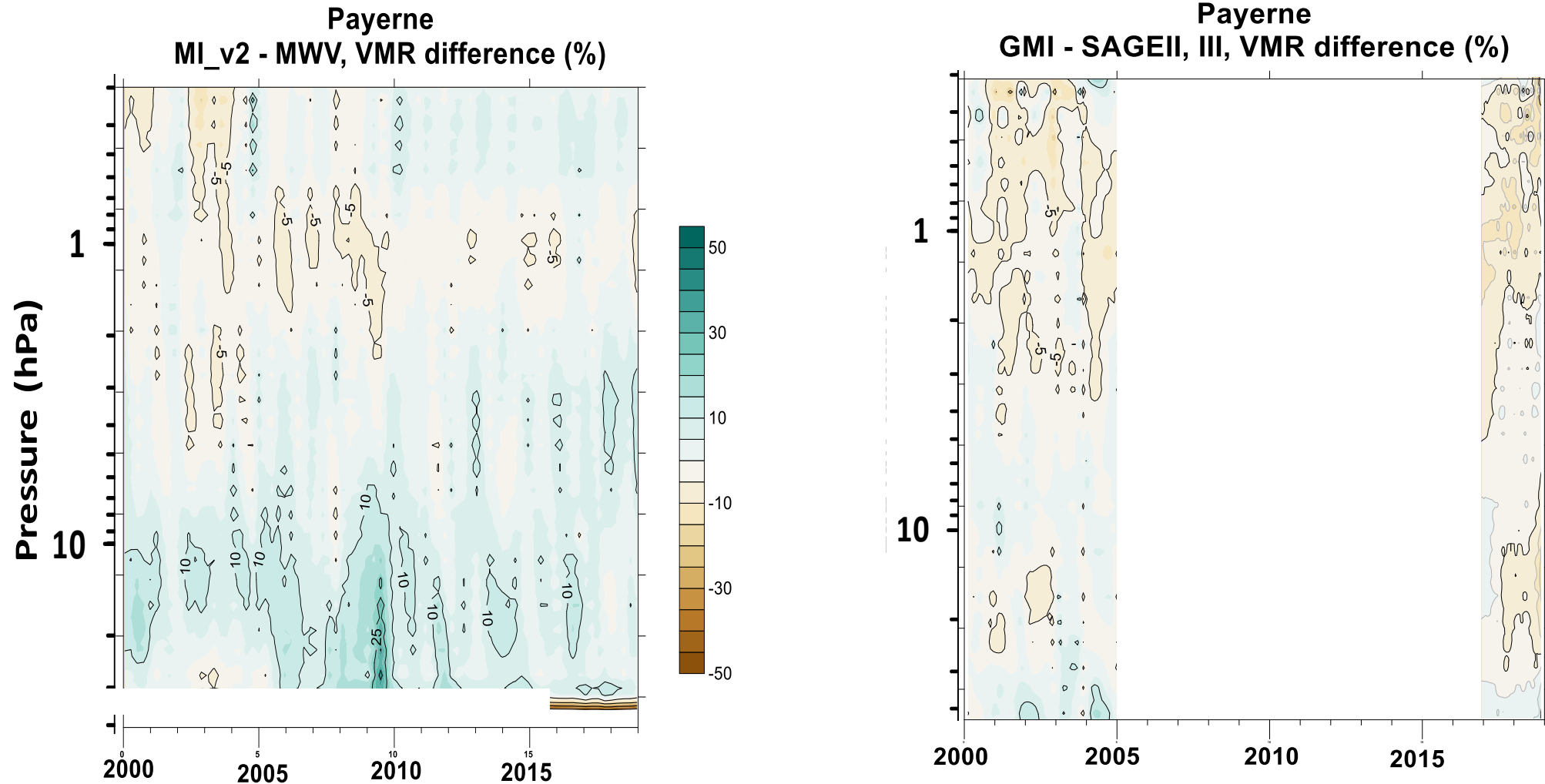
Diurnal ozone changes (i.e. spatial gradient)



- Diurnal variability at 3 hPa (GMI based) can account for biases up to 5 % over Boulder
- Differences between SAGE III ISS and Umkehr that are larger than 5 % are associated with large distances and spatial ozone variability.
- Biases over Lauder and MLO need further investigation
- Diurnal variability changes seasonally and spatially

NDACC ozone profiles for SAGE III/ISS validation

Payerne MW – diurnal ozone variability

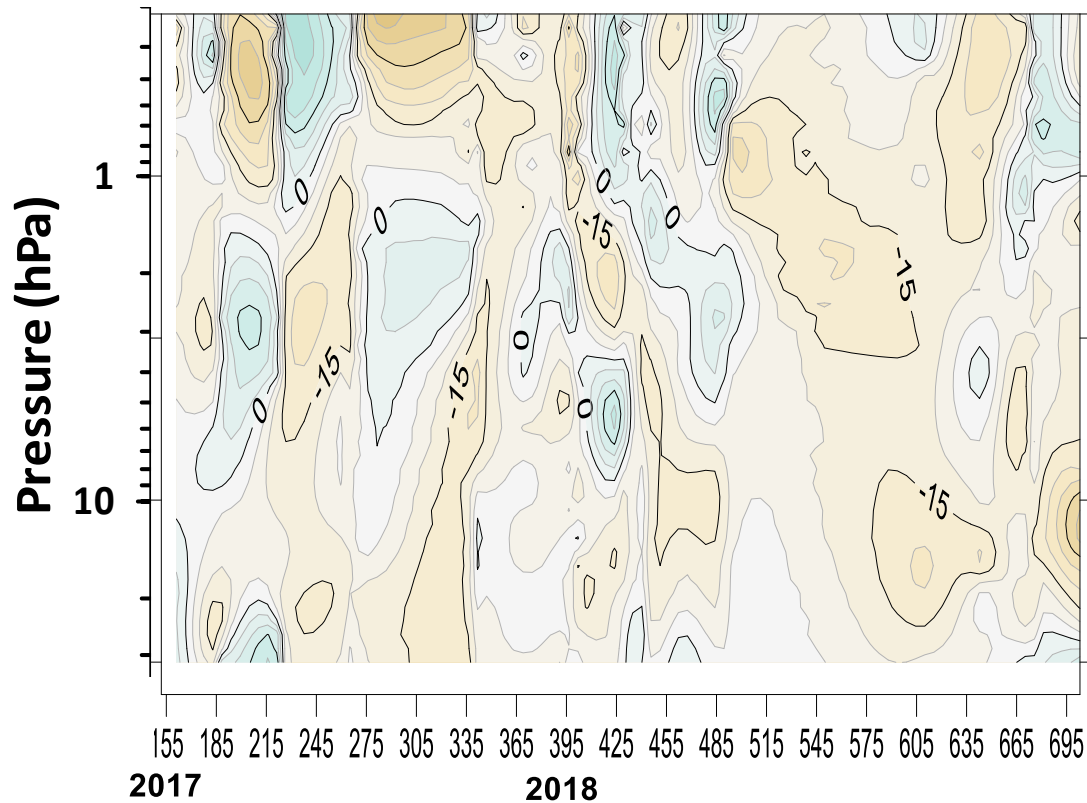


Based on monthly mean and matched within ± 1 hrs

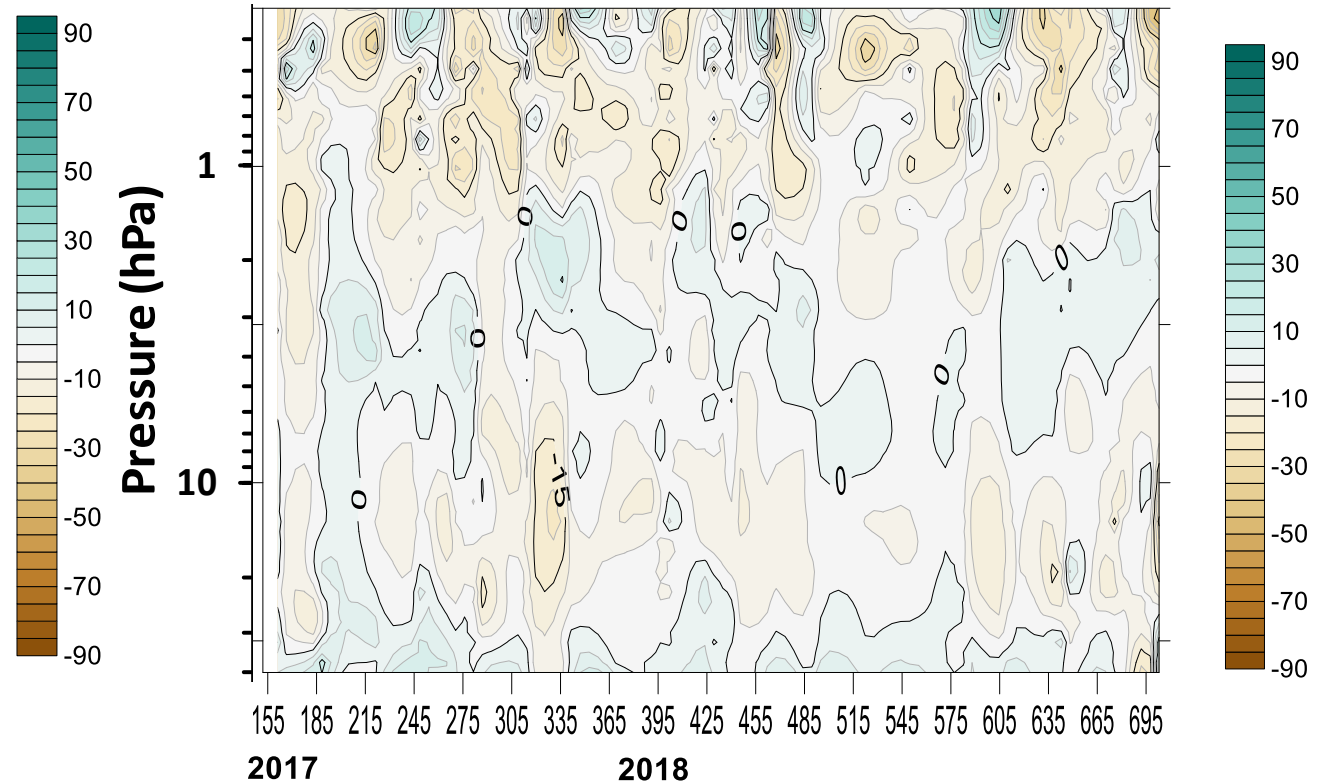
Payerne MW (NDACC), SAGE III/ISS and GMI diurnal ozone variability study

Based on daily ozone and matched within ± 3 hrs

Payerne
MWV - SAGEIII, VMR difference (%)

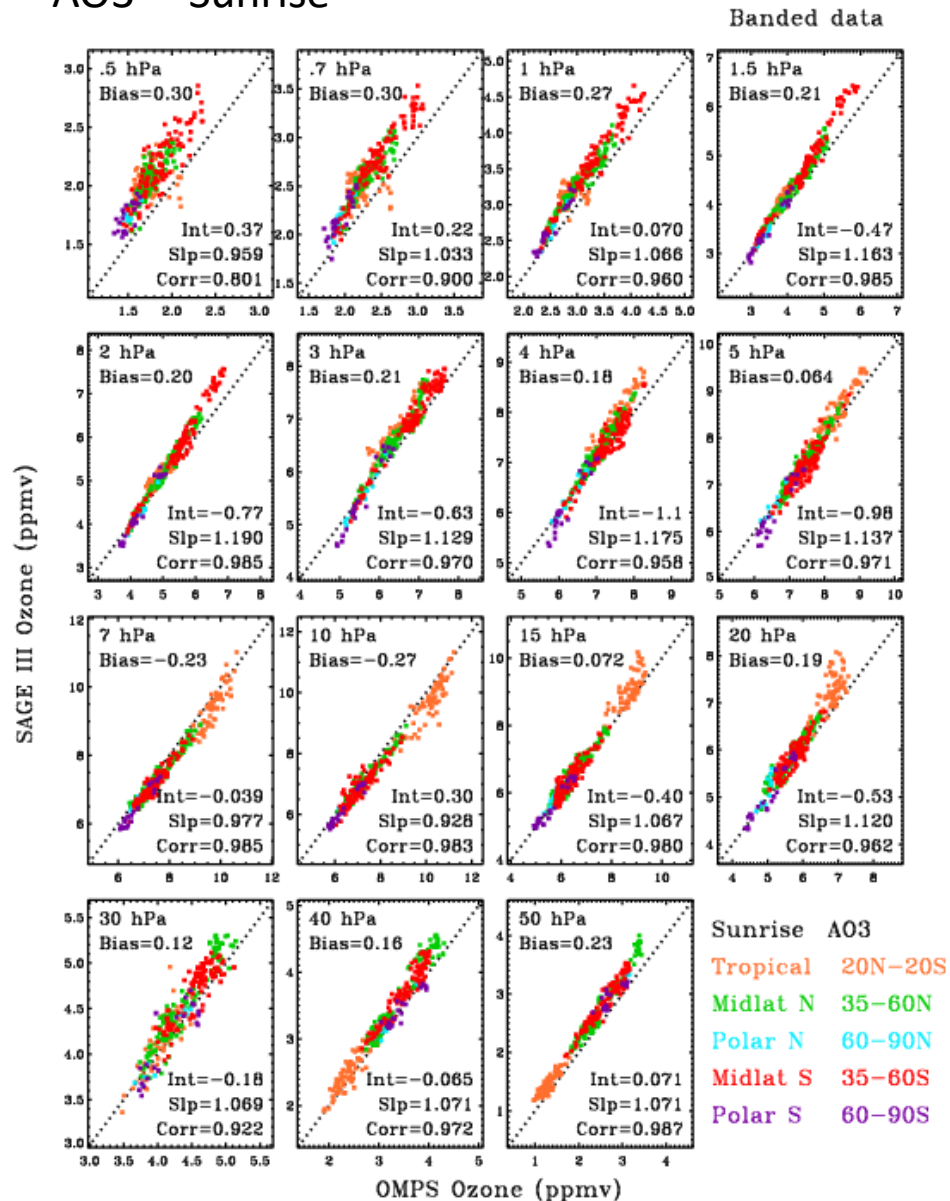


Payerne
GMI - SAGEIII, VMR difference (%)



Do SAGE III /OMPS & MLS comparisons measure up to SAGE II /SBUV &MLS comparisons?

AO3 Sunrise



Statistical parameters from correlation graphs
Bias, Intercept, Slope and Correlation Coeff.

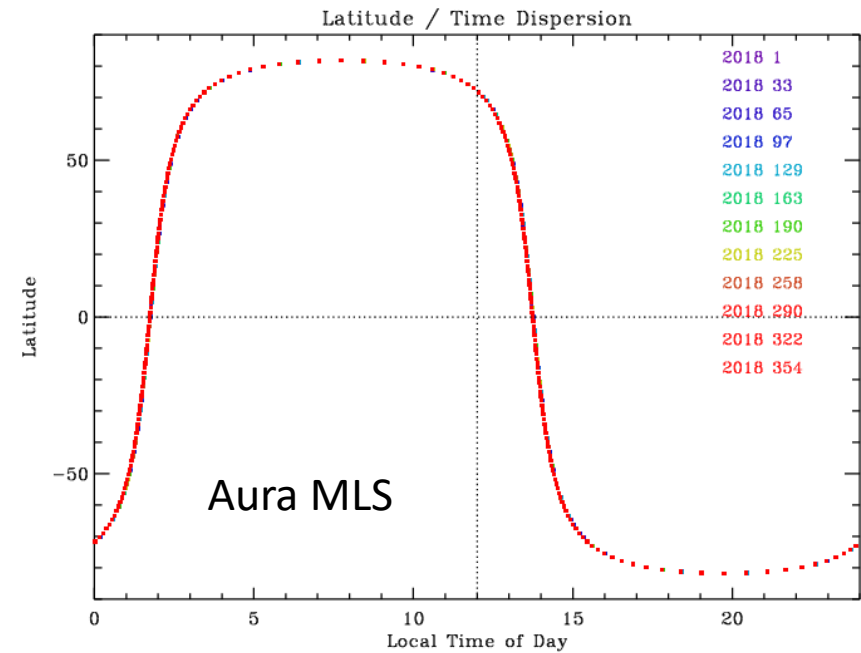
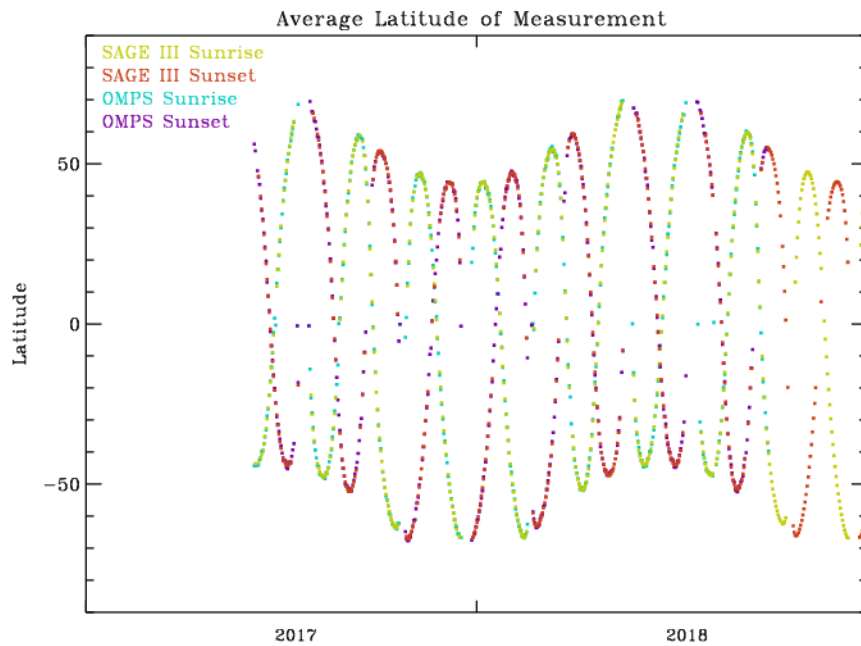
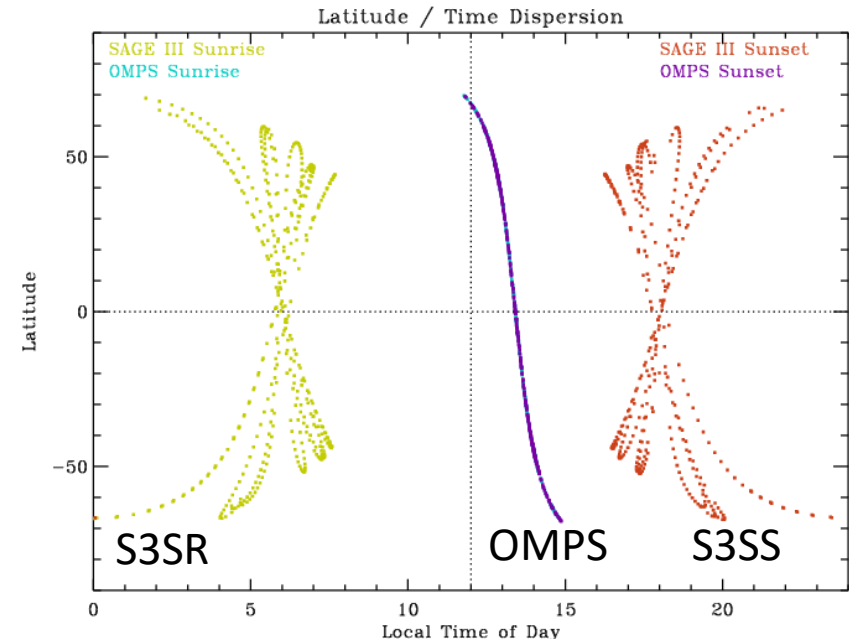
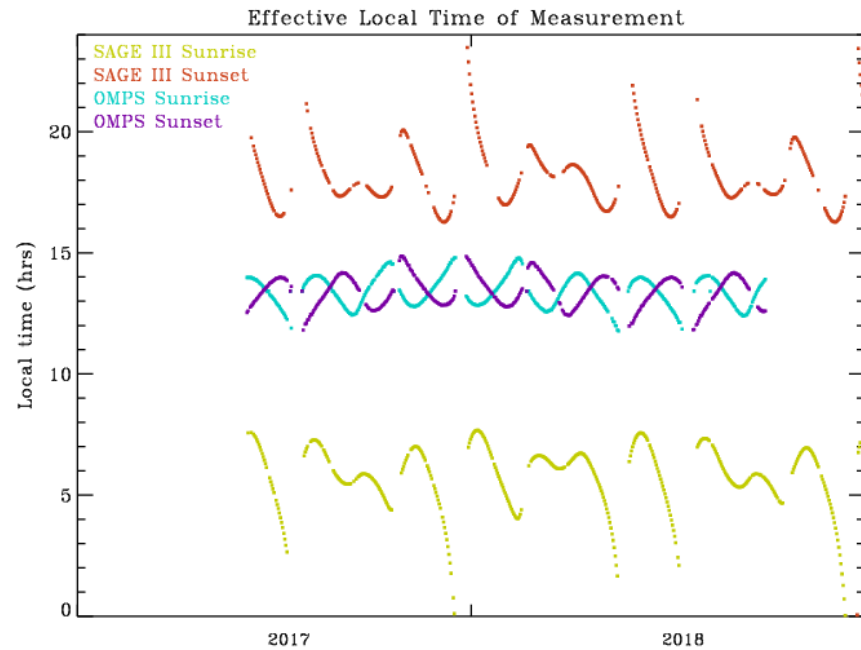
SAGE III Data

- First cut: using all data – accepting all flags
- Create a daily average for each type of measurement (AO3, MLR, Sunrise, Sunset)
- Have not yet looked at Lunar measurements
- Each daily average of approx 15 orbits, samples one latitude, scans approx global in one month [50N (S) to 70S (N)]. No filtering for Error Flags.

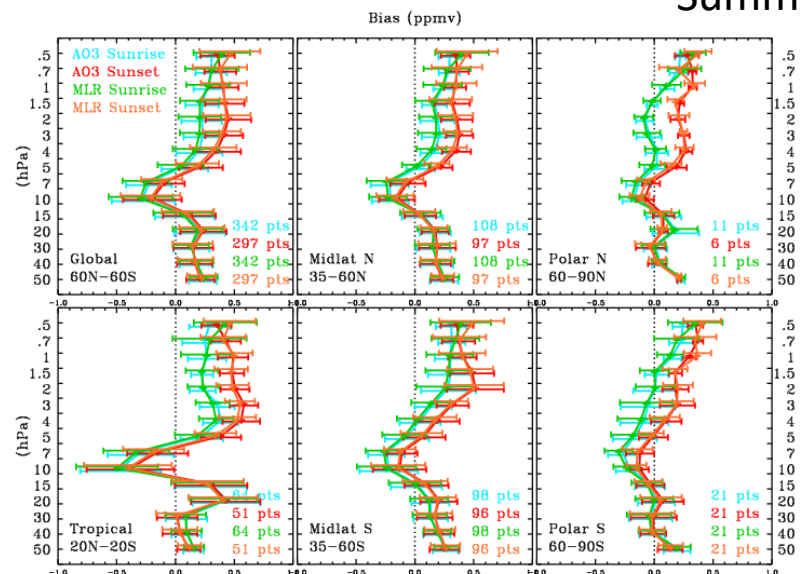
OMPS/SBUV/MLS Data

- OMPS NP EDR - Suomi NPP/NESDIS
- OMPS and SBUV use only error flag 0, best data
- Collect and average all latitude matches for each day using +/- 1.1 degree lat. Also typically collects from all 15 orbits.
- Use data from dates that have at least 10 points in the averages (2/3 of the longitudes are contributing.)

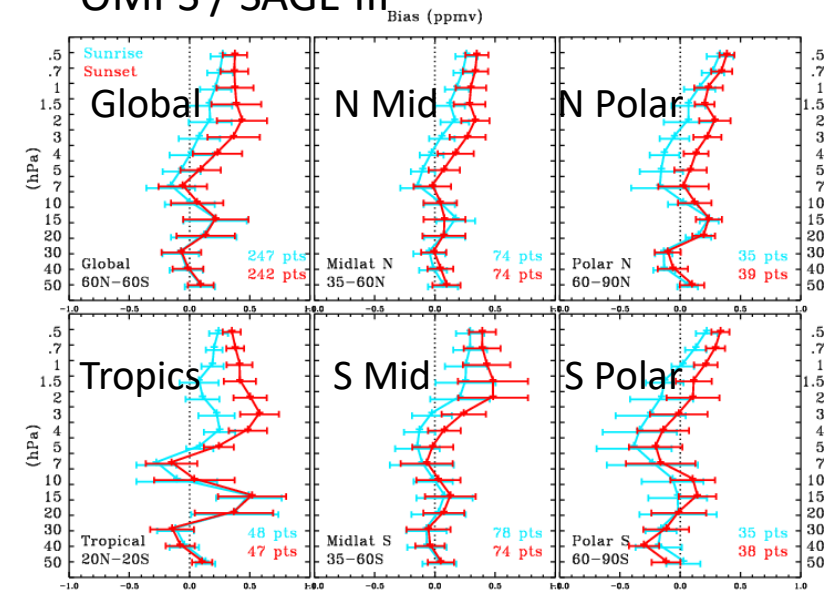
Exploring average daily latitude and effective local time of measurements



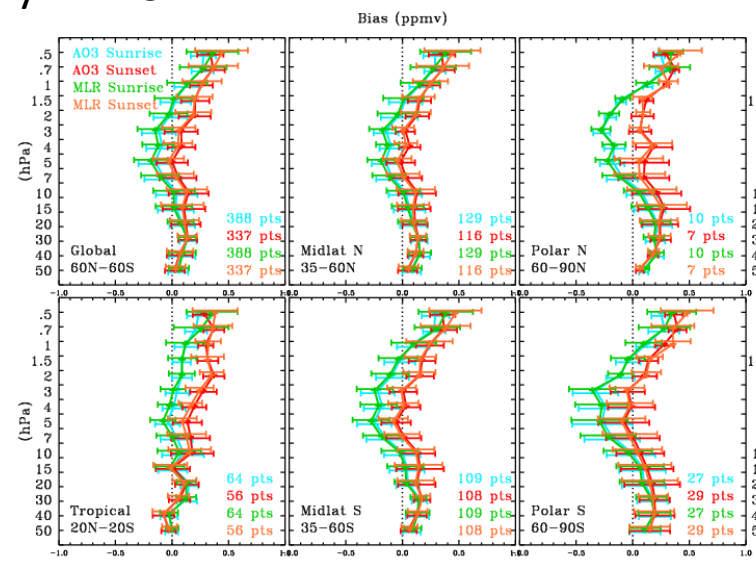
Summary - BIAS



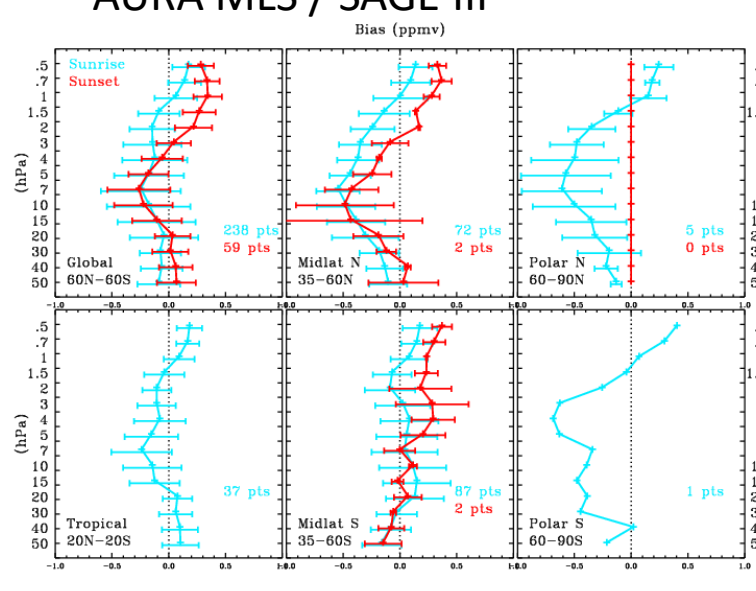
OMPS / SAGE III



N11 / SAGE II



AURA MLS / SAGE III



UARS MLS / SAGE II

Findings Summary:

- OMPS-NP to SAGE III: Diurnal variation in bias is more apparent in Southern Hem. In the lower levels.
- Examination of SAGE II to UARS MLS does not have enough data in each band to be meaningful for Sunset.

Extra slides