Daily Tropospheric Ozone Residual

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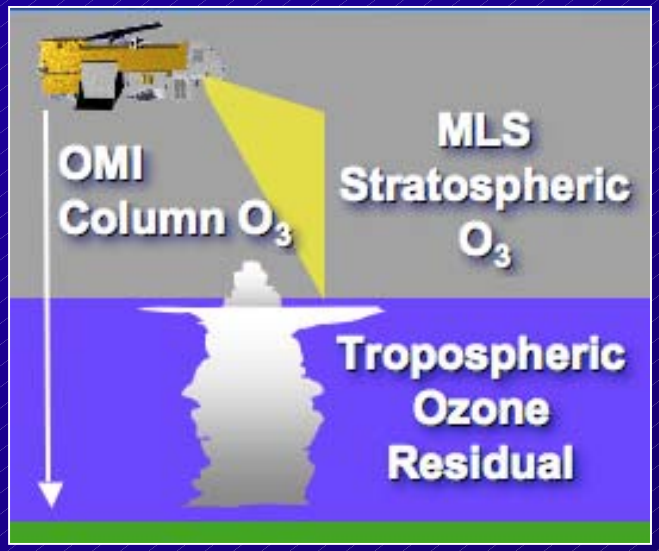
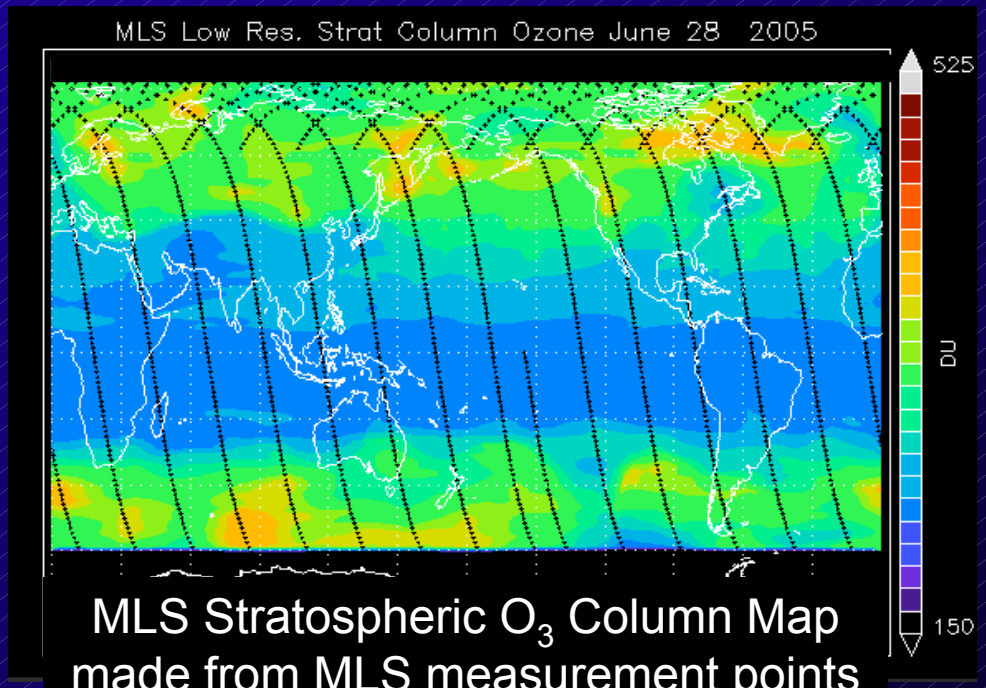
Tropospheric Ozone Residual (TOR)

Subtraction of OMI data from MLS

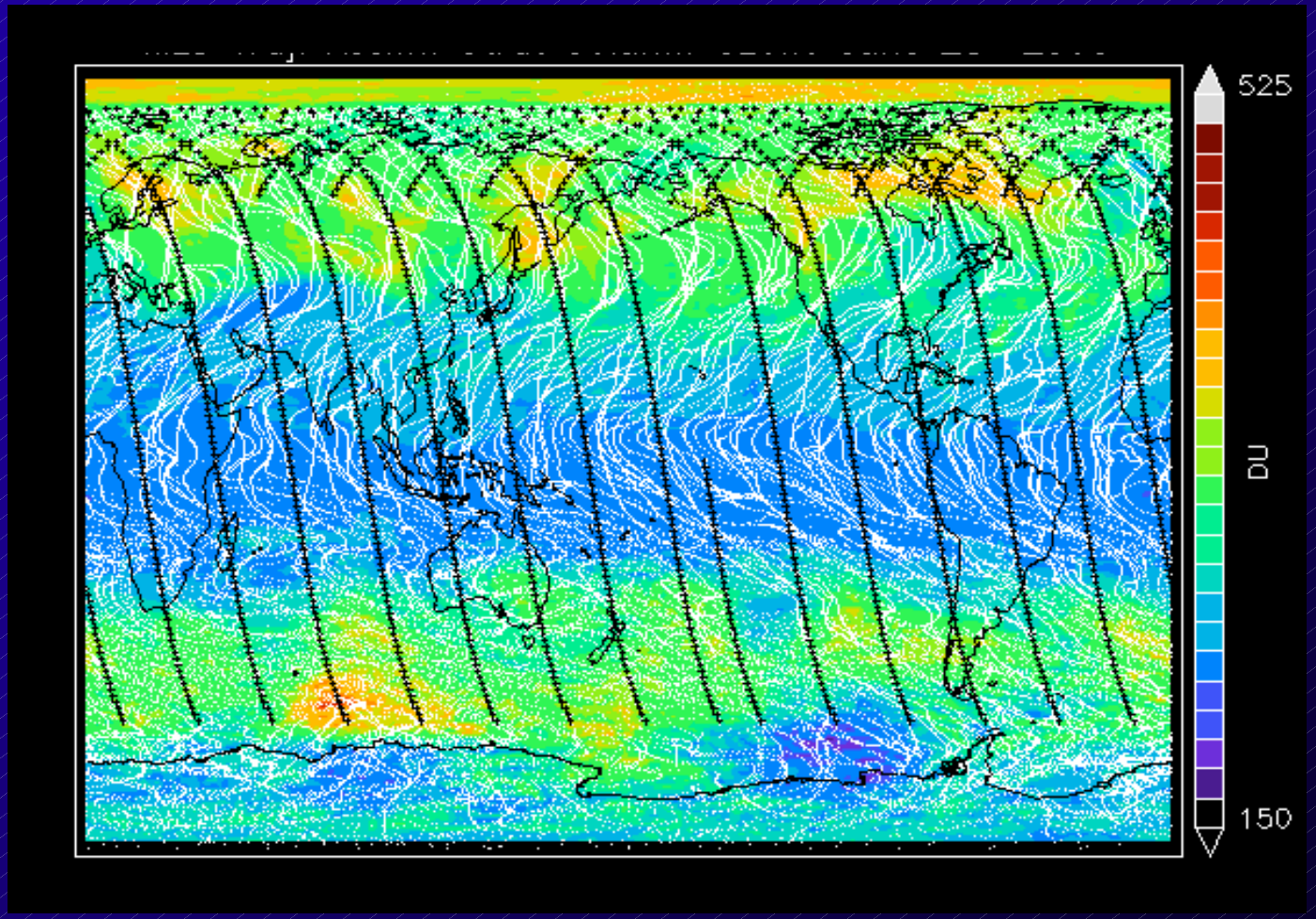




MLS Stratospheric O_3 Column Map made from MLS measurement points shown

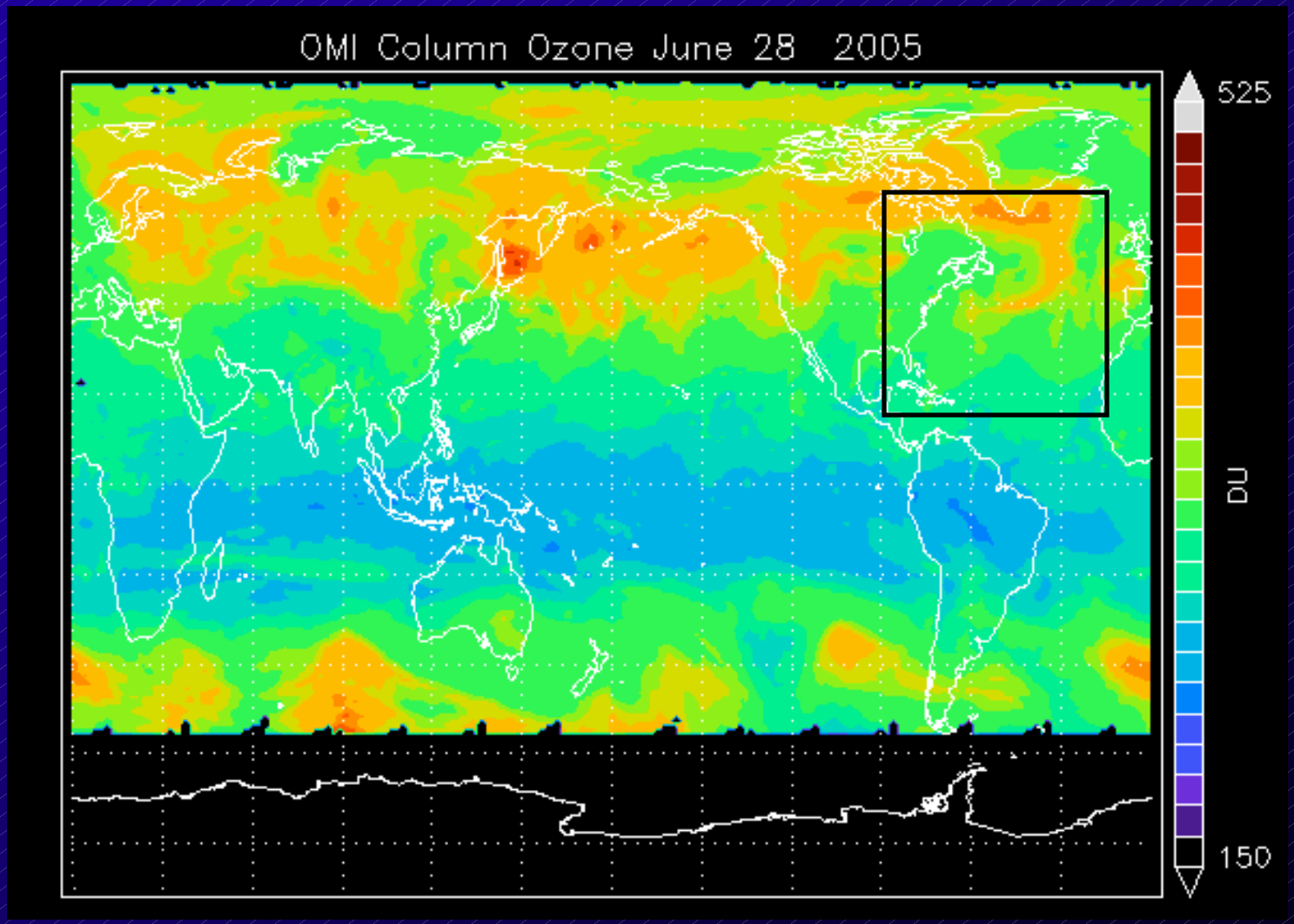
Problem: MLS stratospheric data has much lower spatial resolution than OMI (~25º vs ~0.25º). Ascending node only ~ 14 orbits ~ 7 zonal wavenumbers

High Resolution Stratospheric Ozone Column

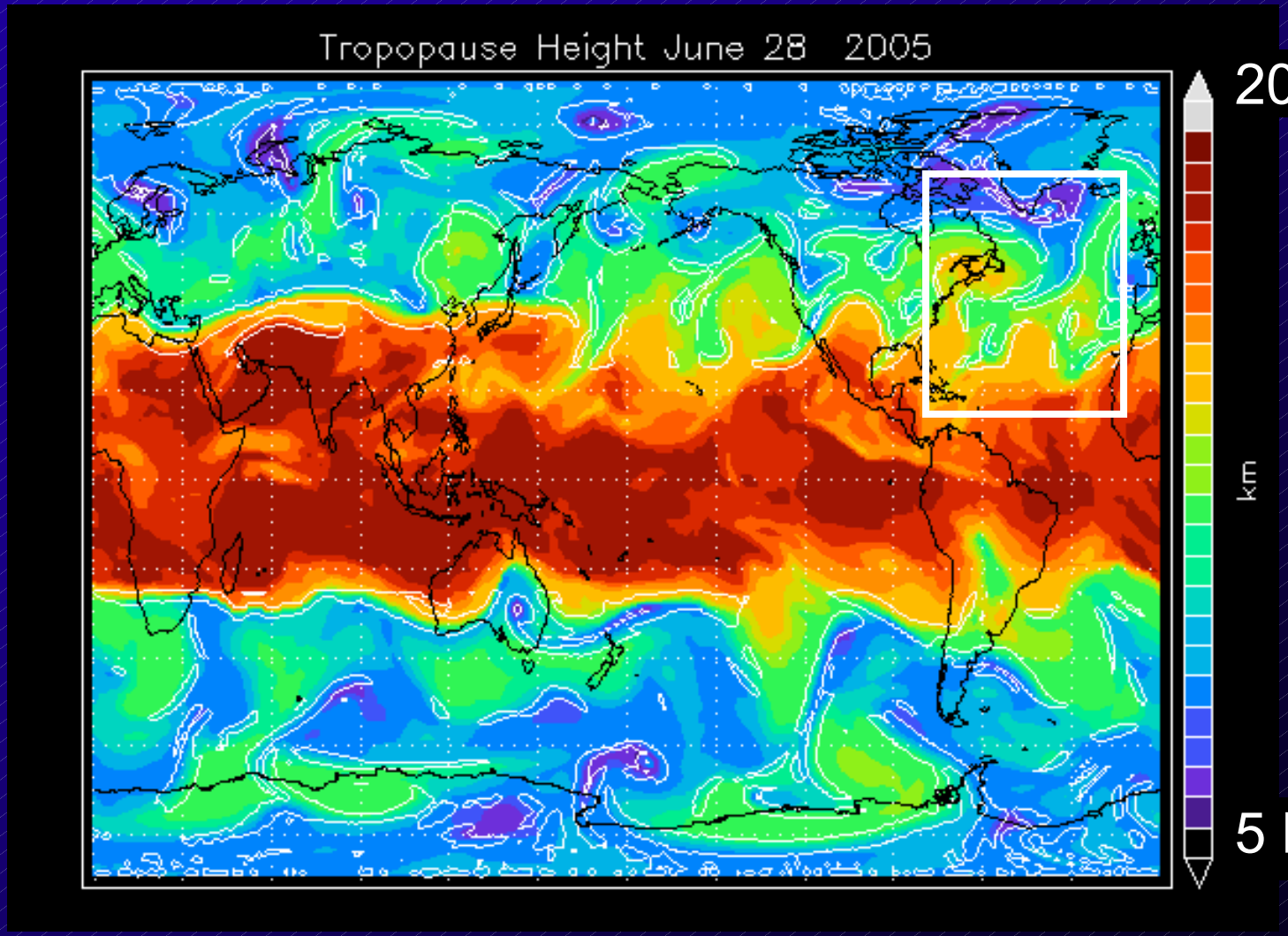


MLS data forward trajectory mapped from the previous 6 days plus the MLS day time orbit track. Theoretical Improvement: 6 days of trajectory mapping ~ 40 zonal wavenumbers can be resolved.

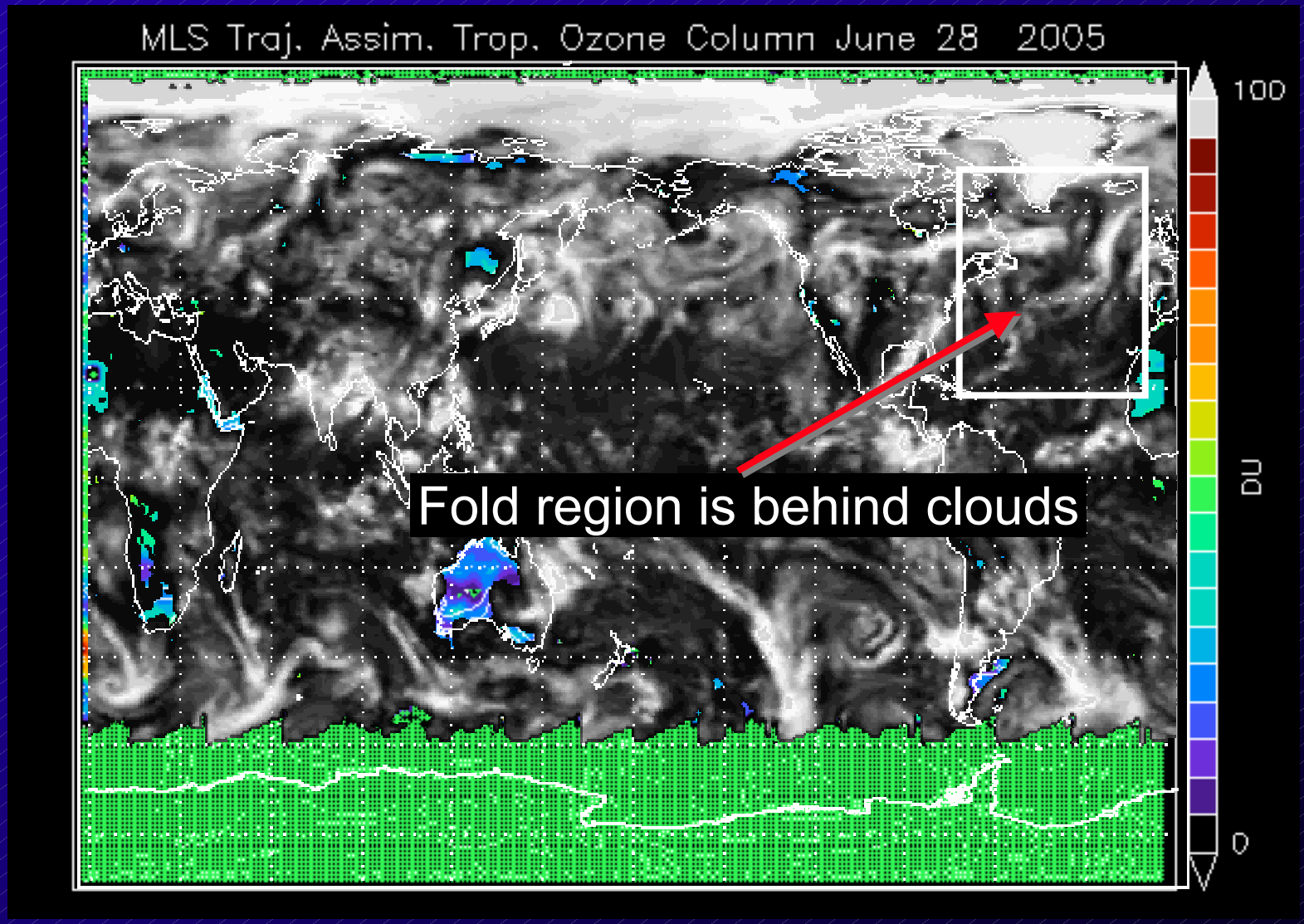
Column Ozone June 28, 2005



Tropopause Height
June 28, 2005

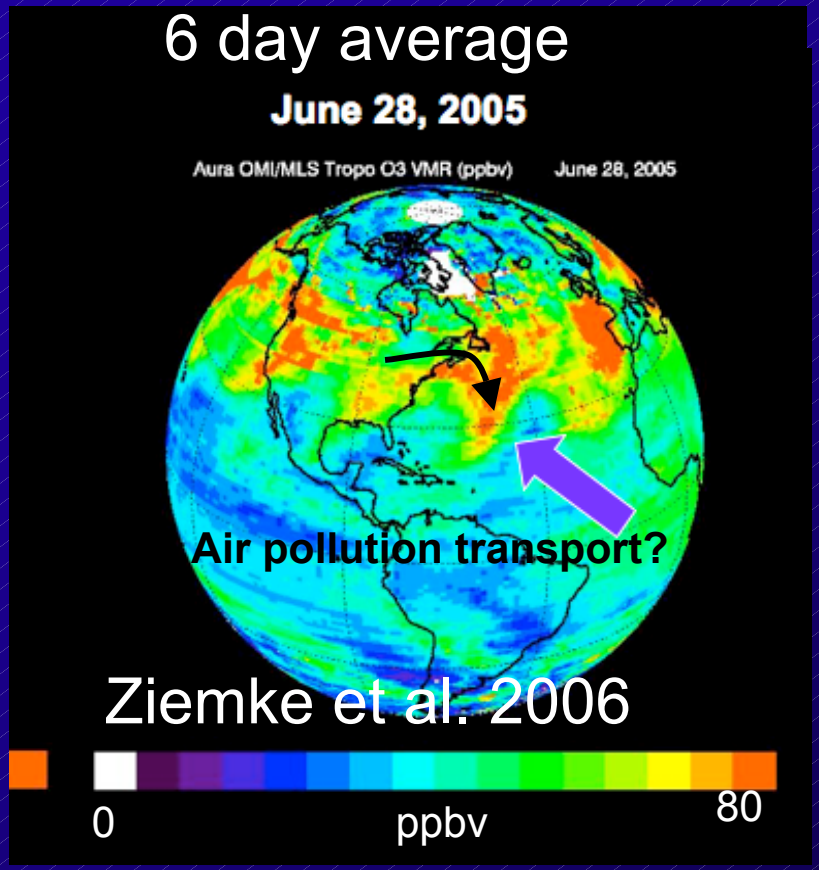


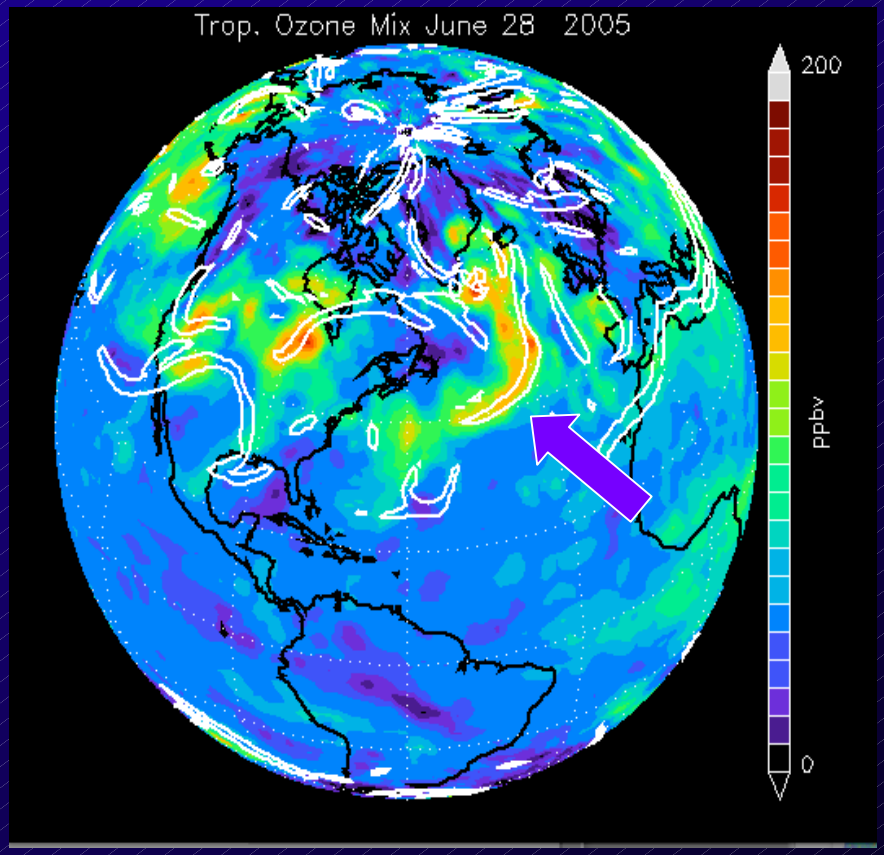
HTOR



+ = data flags indicate missing or bad data

Tropospheric Equivalent Mixing Ratio

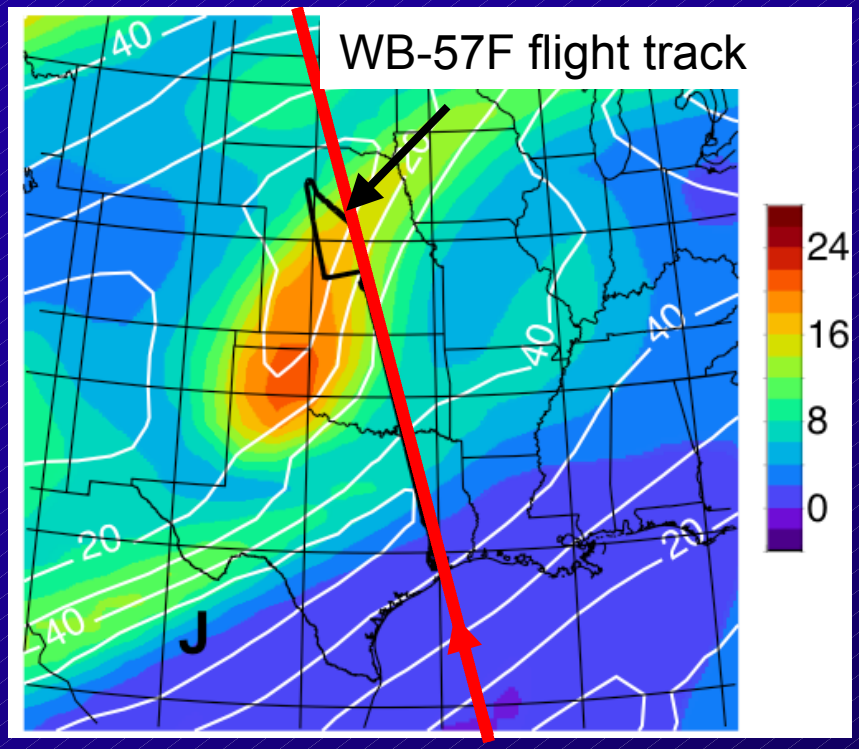




This day shows a high ozone region off the U. S. east coast.
The fold identification scheme (white) shows that this feature appears to be due to a stratospheric ozone fold, not pollution. Daily ozone “equivalent mixing ratios” are usually high - much higher than the 6 day average.

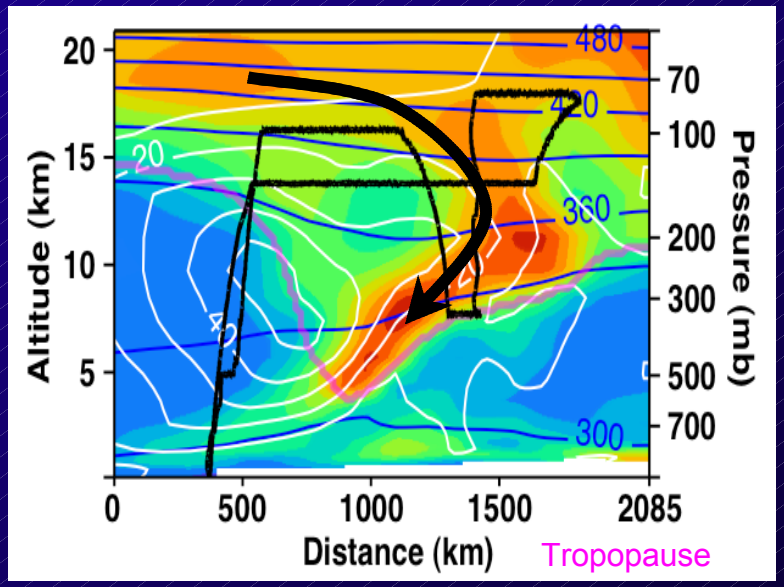
Fold Validation from AVE

November 3, 2004 Tropopause Fold Flight

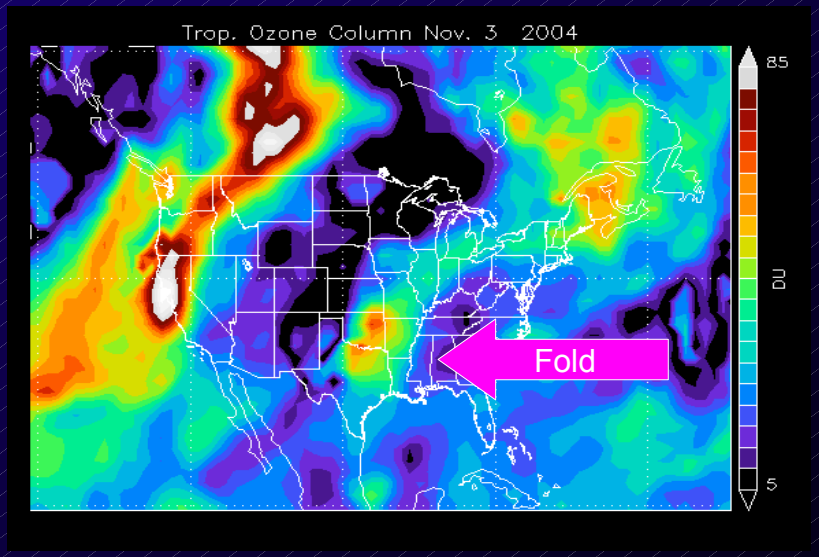


Aura nadir track

MPV (pv units)



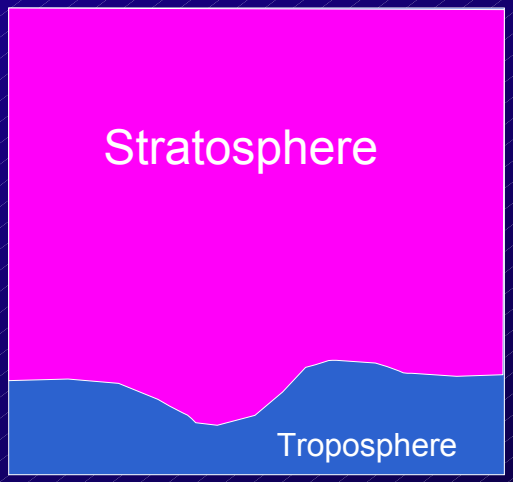
Tropospheric Ozone Product



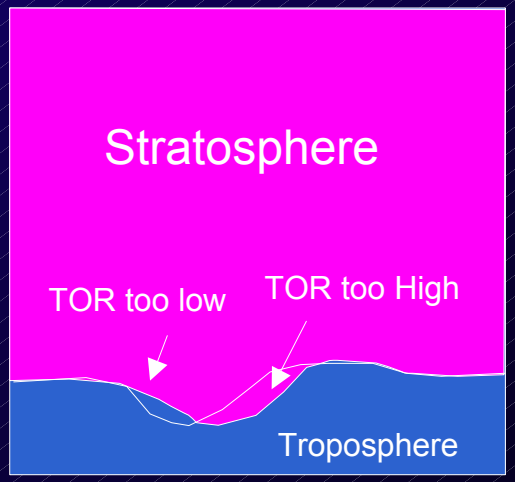
Time Synchronization and Folds

A rapidly moving fold can create a TOR anomaly unless the strat. column, tropopause computation and OMI total column are time synchronized.

What should happen



What can happen

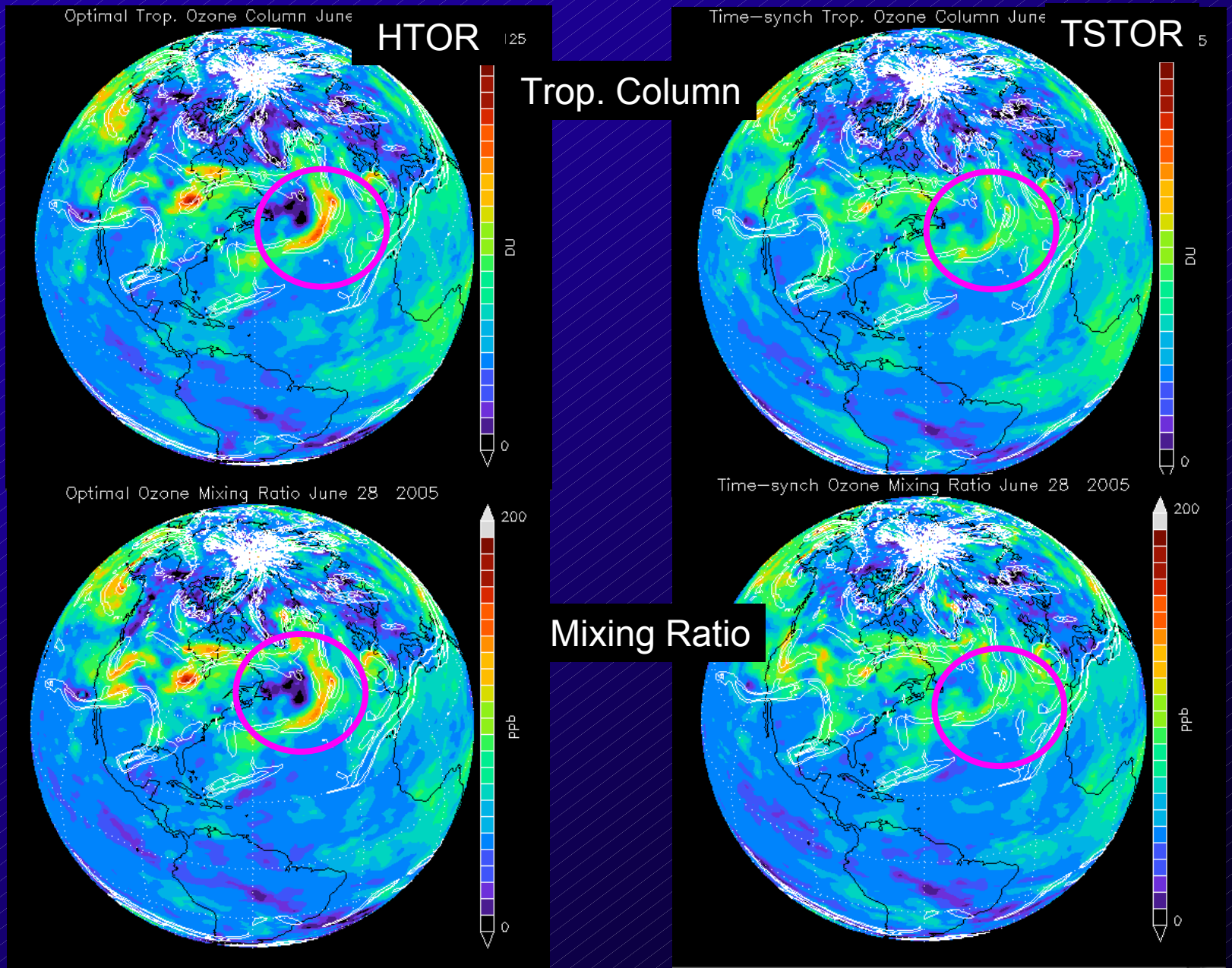


Time Synchronized TOR (TSTOR)

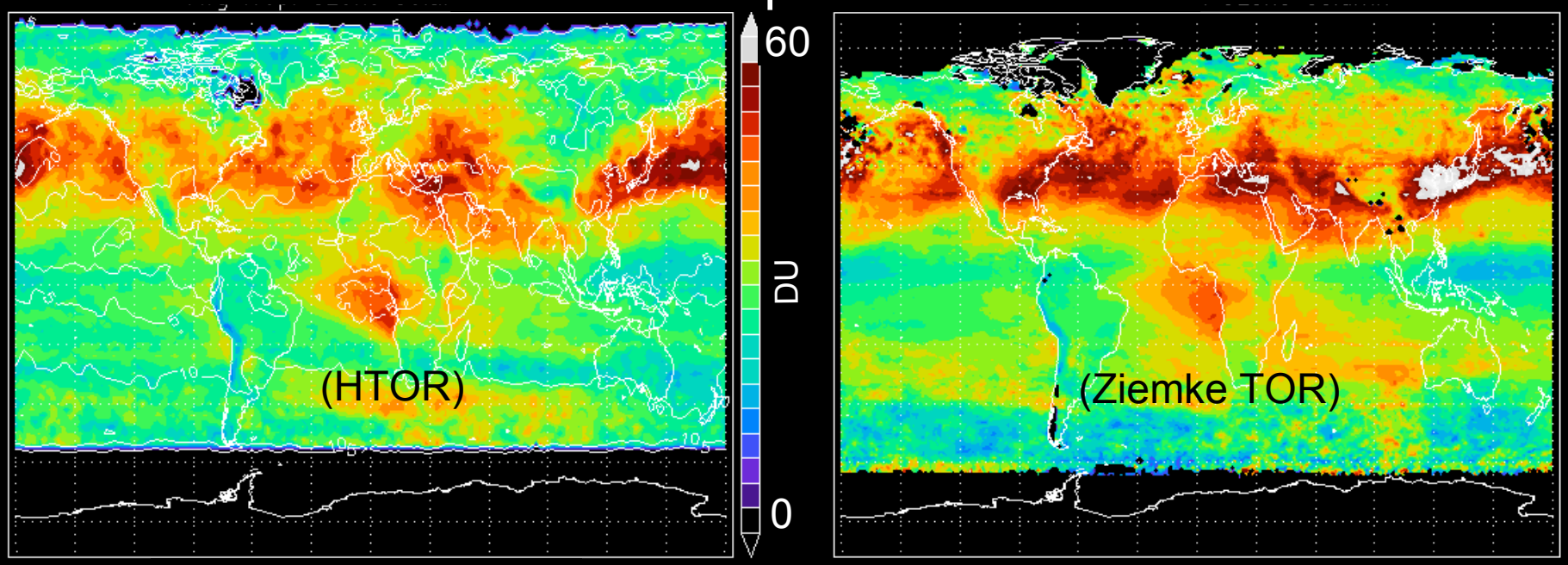
- Uses OMI L2G with measurement time stamp
- Forward trajectories are grouped in time for target day (1/20th day resolution)
- Tropopause is time interpolated from 6 hour DAS

- Product has same zonal mean as HTOR
- Fold TOR greatly reduced

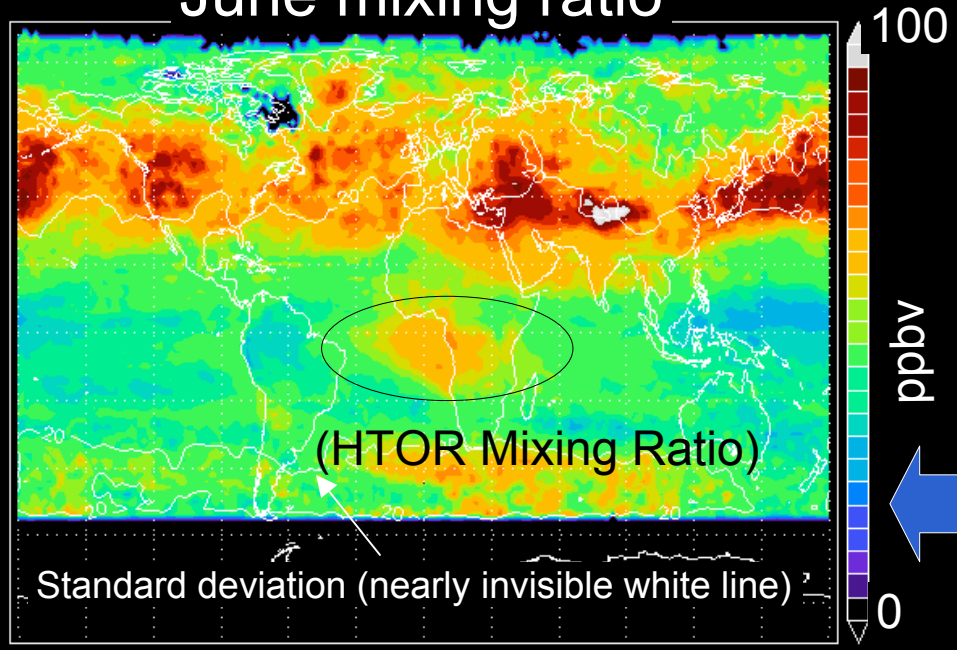
Time Synchronized Product



June ‘05 Trop. Column Ozone



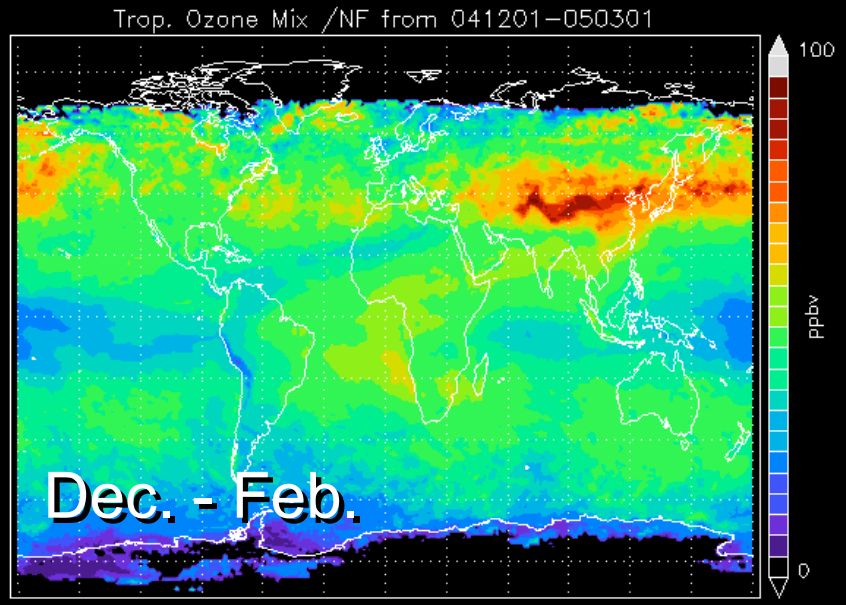
June mixing ratio

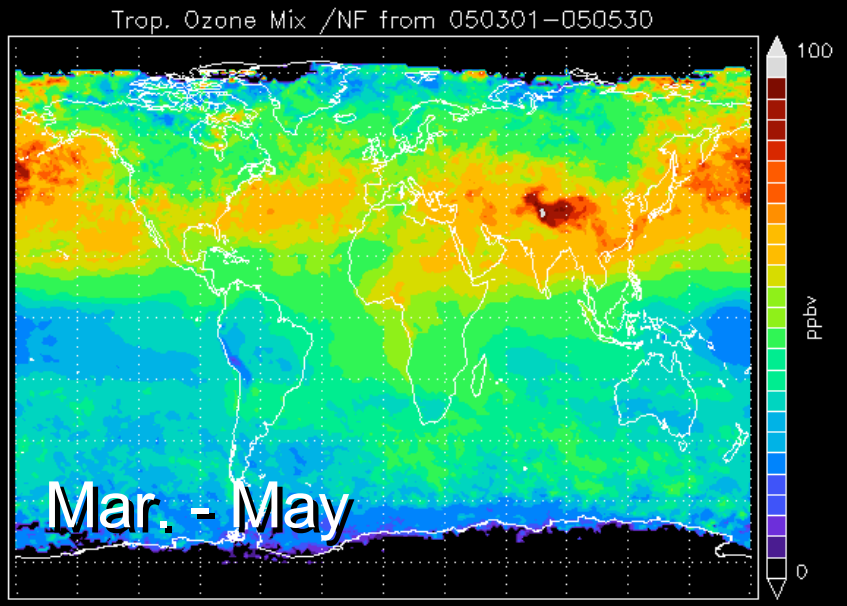


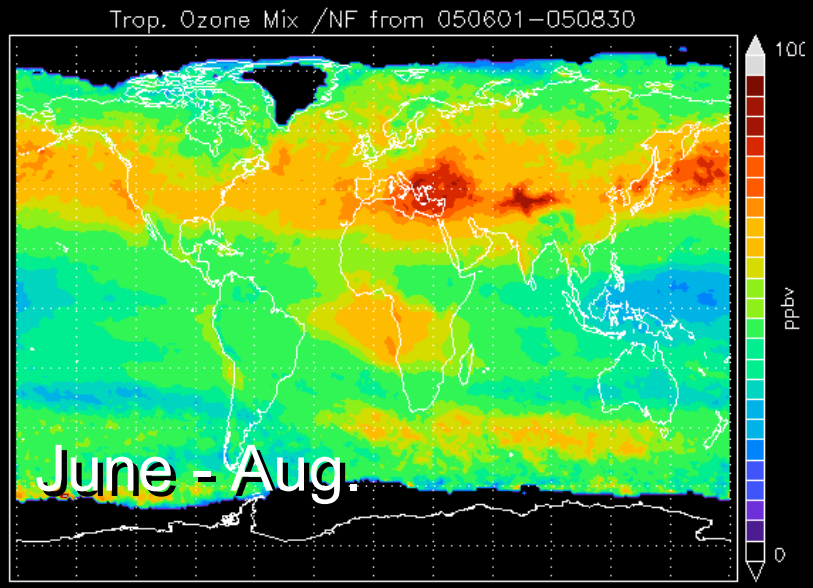
Tropopause height is computed using PV in the extratropics which generally puts the tropopause lower. Thus will be lower than ZTOR. Daily surface pressure is used to compute the tropospheric equivalent mixing ratio.

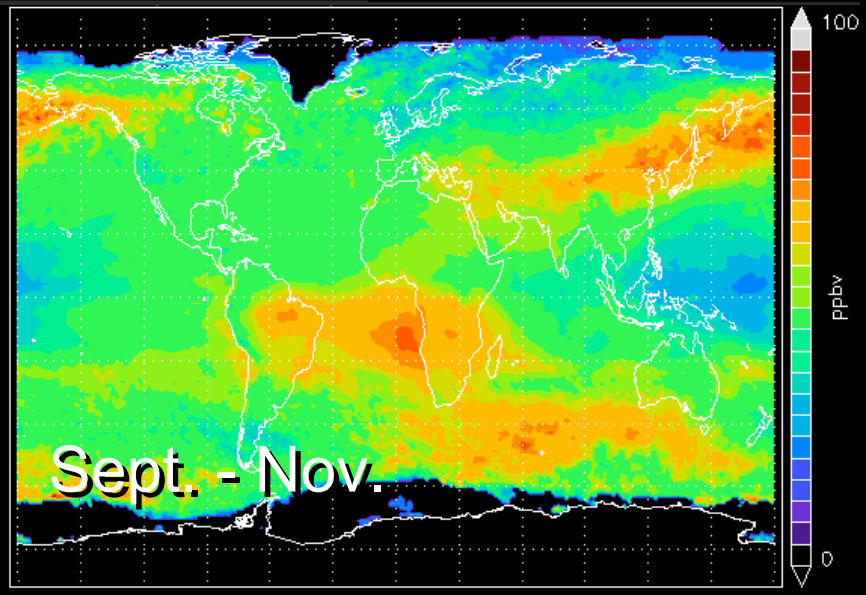
The tropospheric equivqlent mixing ratio tends to reduce the topographic effects.

Seasonal HTOR folds-removed







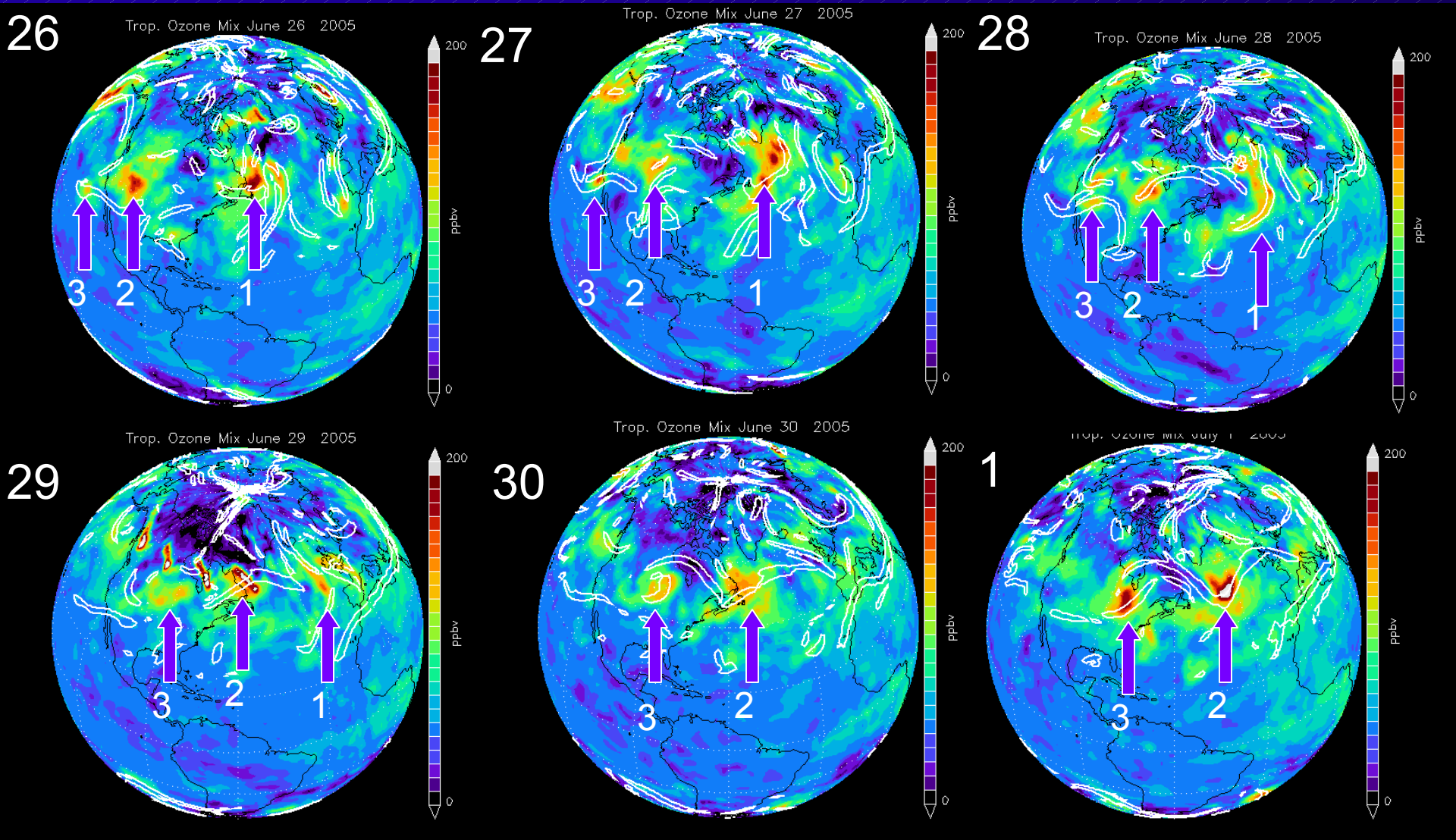


Summary

- Forward Trajectory transport of MLS data is used to create a high horizontal resolution stratospheric column which is used to produce a high resolution TOR (HTOR)
- Fold events appear to dominate extra-tropics in HTOR and Ziemke TOR but..using better time synchronization fold event amplitudes are greatly reduced.
- Validation of this product is on going - sonde comparisons product shows some offset from Ziemke probably due to different extra-tropical tropopause heights (see poster by Morris et al.).

The End

Marching folds June 27- July 1
Tropospheric Ozone Mixing Ratio



Seasonal TOR (June-Aug.)