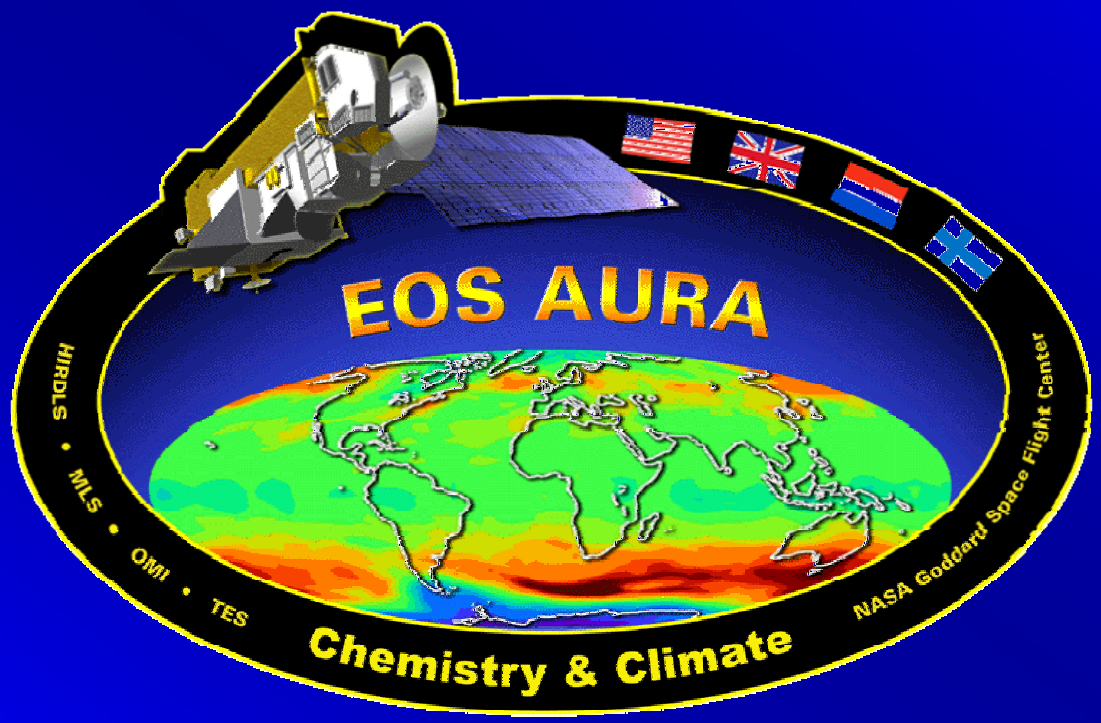
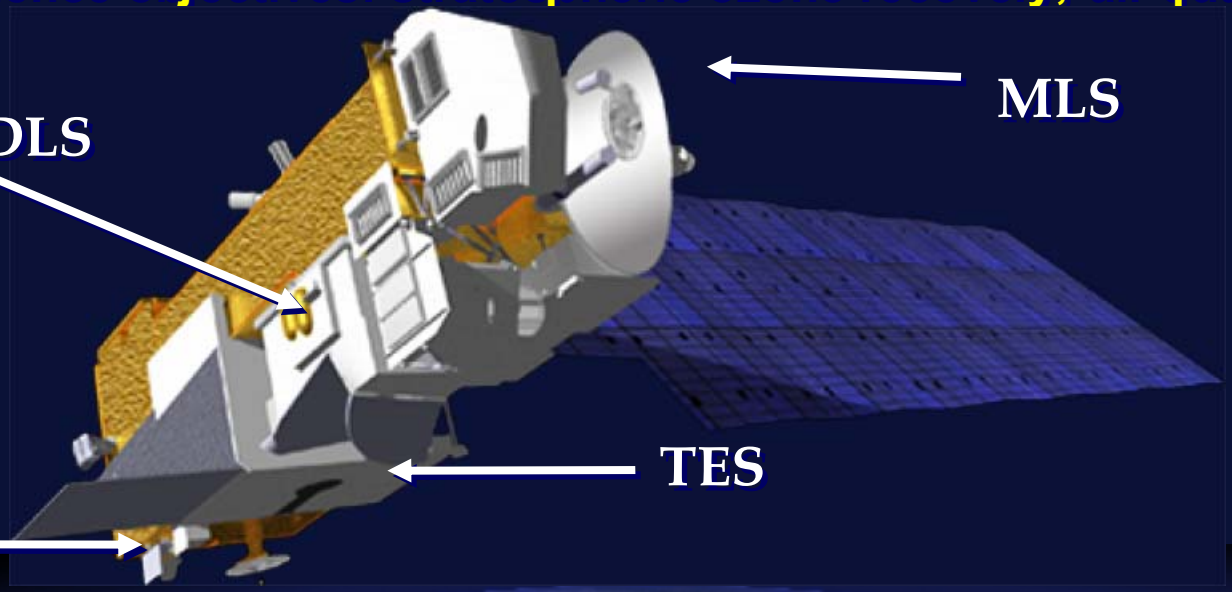
Aura Measurements and GMI



M. Schoeberl, A. Douglass

For those who came late… EOS AURA

- Third of the big EOS platforms (Terra and Aqua are the other two)
- Orbit: Polar: 705 km, sun-synchronous, 98° inclination, ascending 1:45 PM equator crossing time. AURA follows AQUA in the same orbit by 15 minutes.
- Launched VAFB, July 15, 2004
- Six Year Spacecraft Life
- Main science objectives: stratospheric ozone recovery; air quality



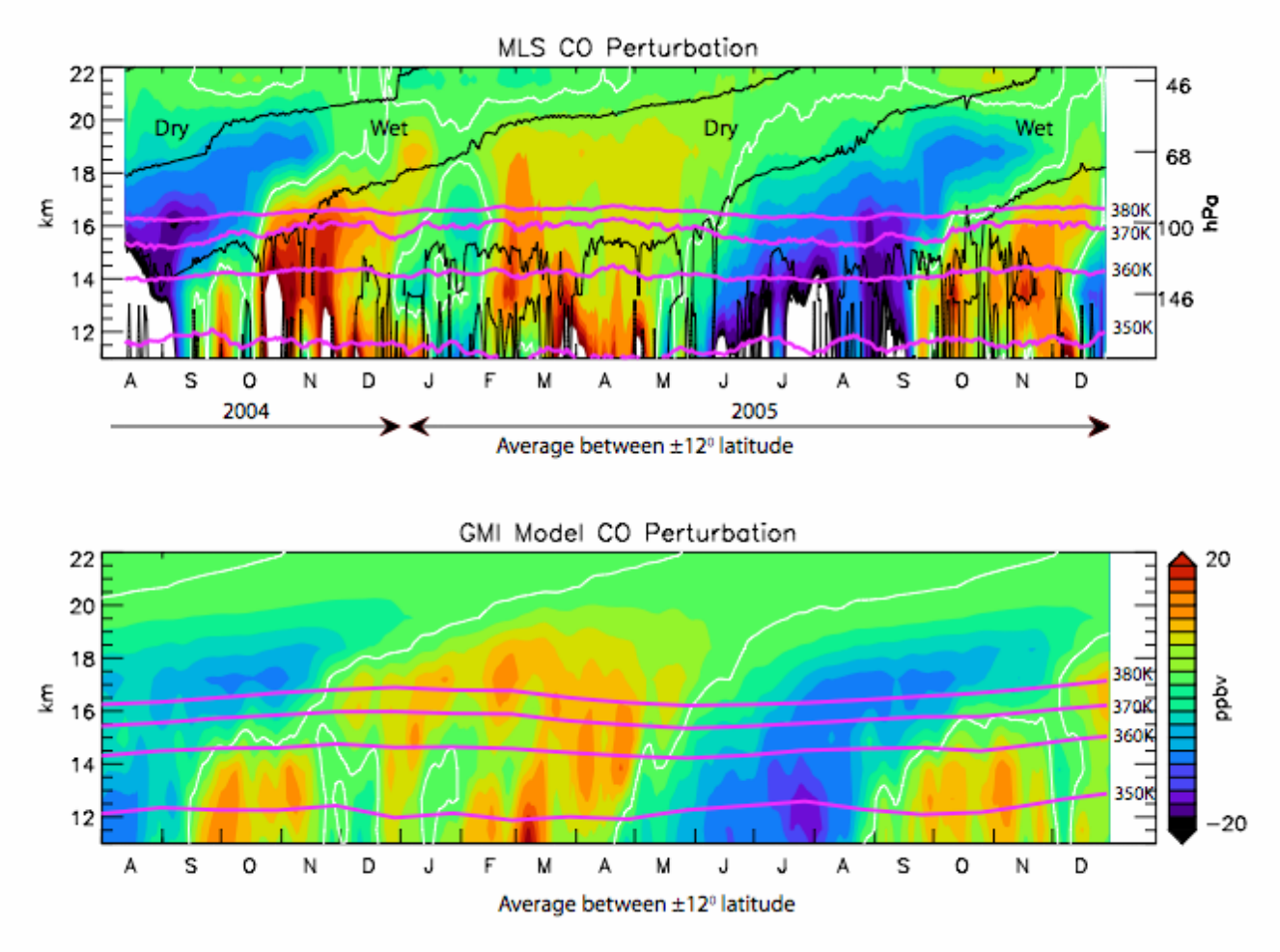
Available Aura Data

- MLS
  - Stratosphere: N_2O, HCl, O_3, ClO, HCN, HNO_3, CO, H_2O, OH, HO_2, [BrO]
  - Upper Troposphere: H_2O, CO, O_3, HCN, Cloud Water Ice
- OMI
  - Column Aerosols, NO_2, O_3, SO_2 …
- OMI+MLS
  - Tropospheric column residual from various people
- TES
  - Individual point measurements of O_3 and CO nadir profiles
- Data issues
  - MLS gets noisy z<200mb - need to average; biases exist
  - OMI may not be seeing the whole NO_2 column

Tropical UT/LS

MLS

GMI

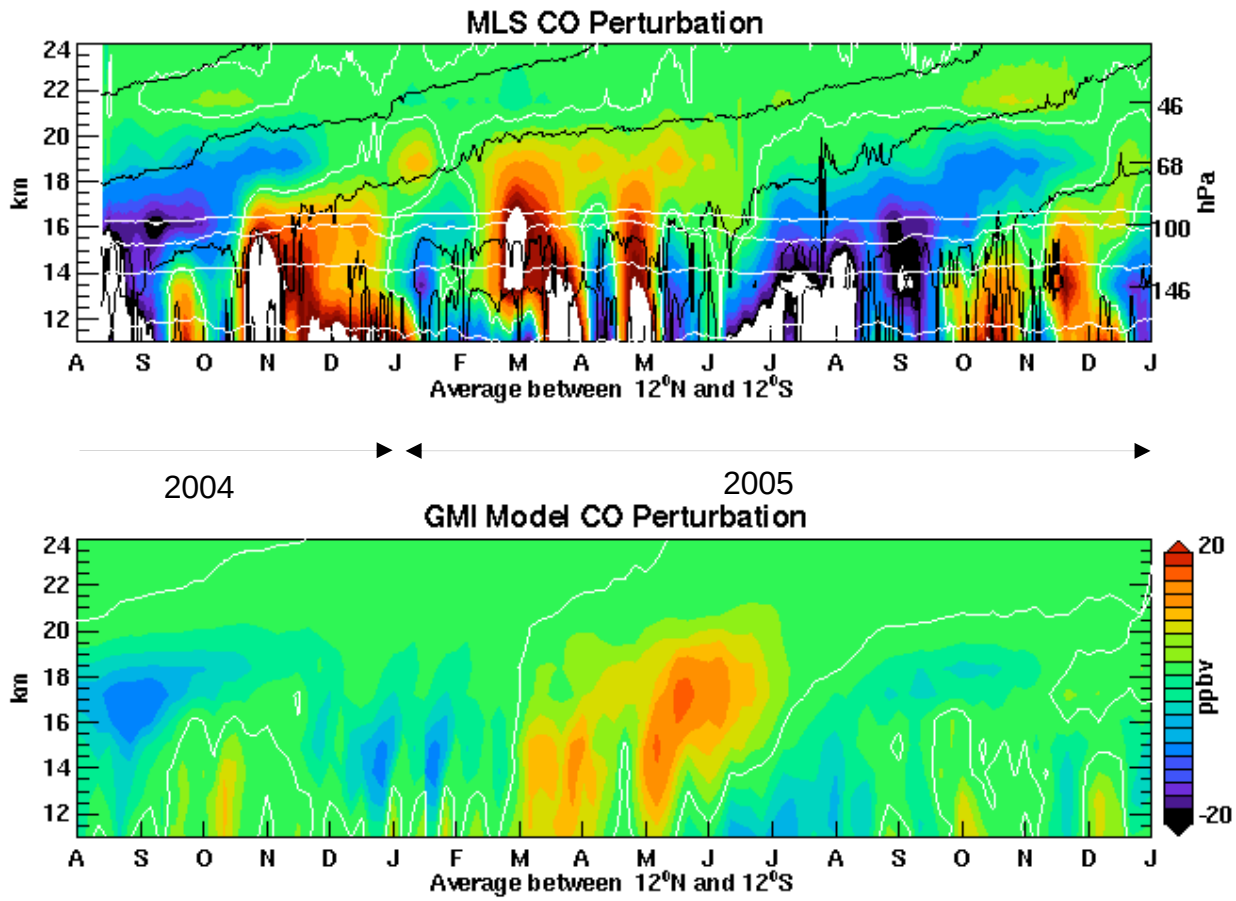


GMI model for 1994/5
Schoeberl et al. [2006]

Updated GMI Results

MLS

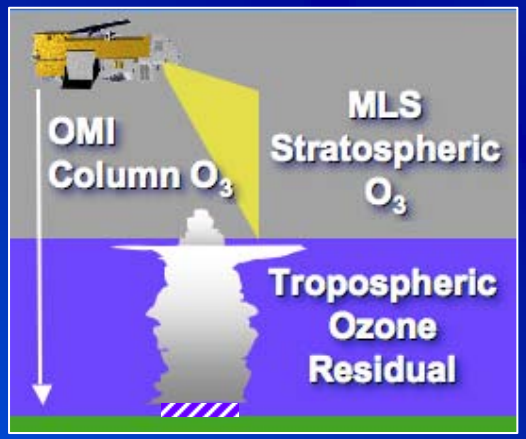
GMI

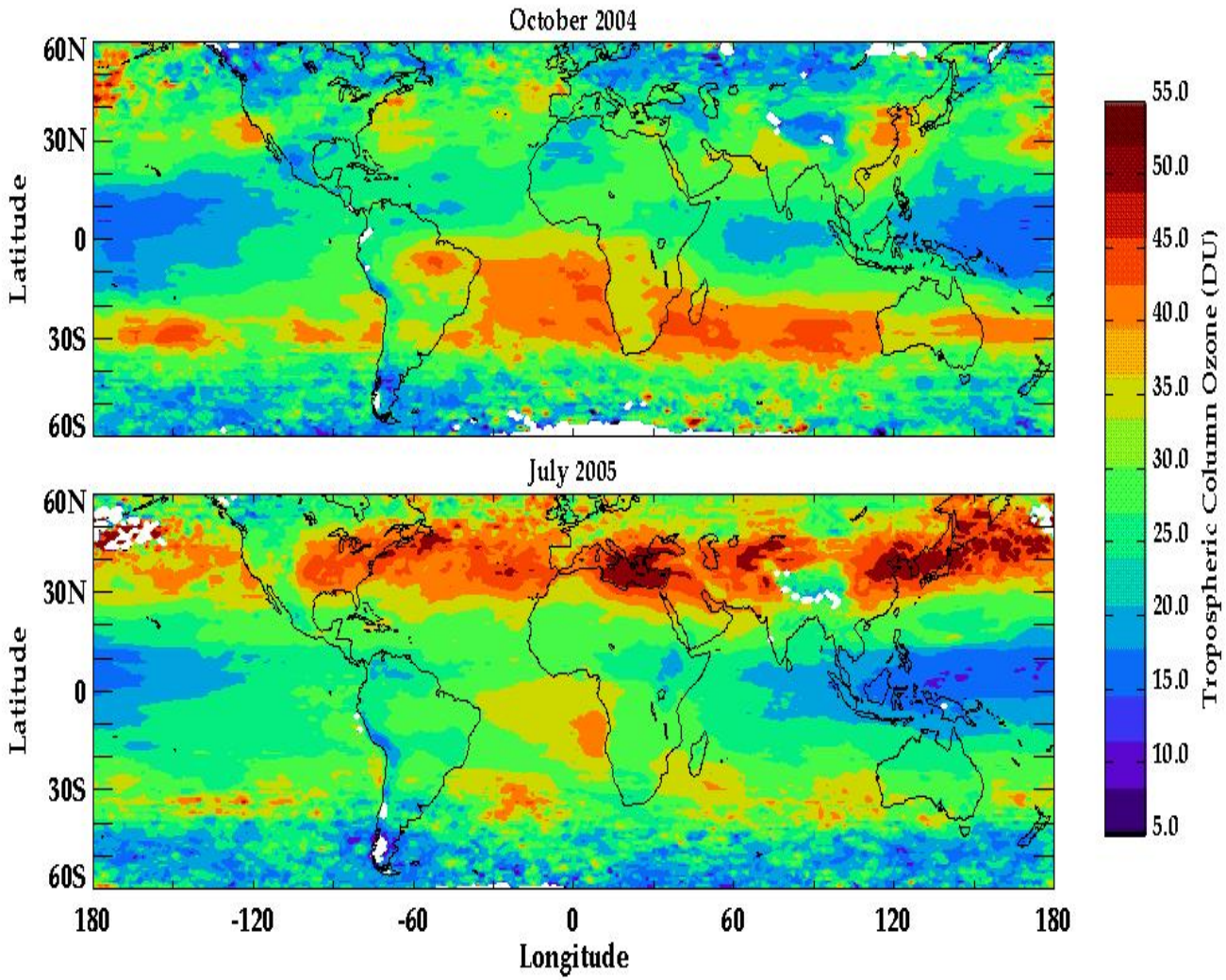


5-7 days of data per month

2004/2005

OMI & MLS: Global Tropospheric Ozone Residual



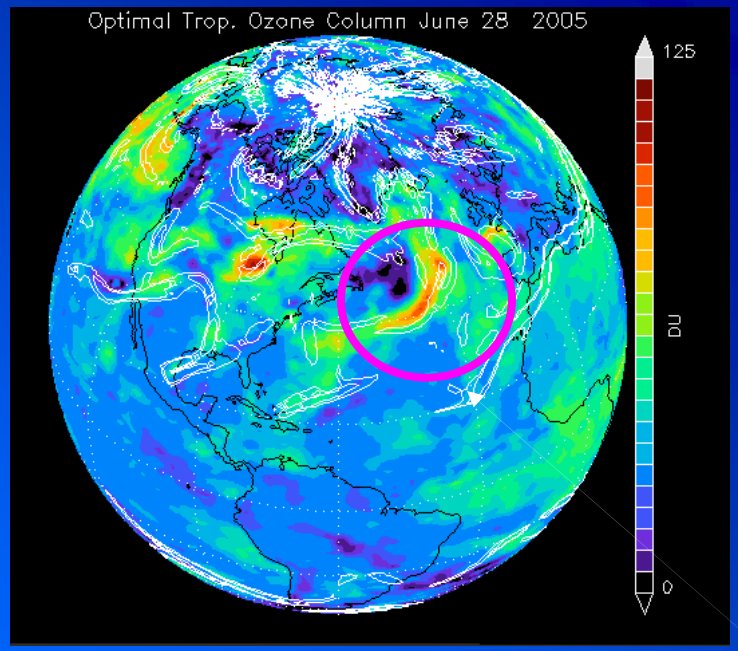


Augmenting TES tropospheric ozone measurements, OMI & MLS can produce a tropospheric residual product by subtracting the MLS stratospheric ozone from OMI column ozone.

Ziemke et al. JGR, 2006

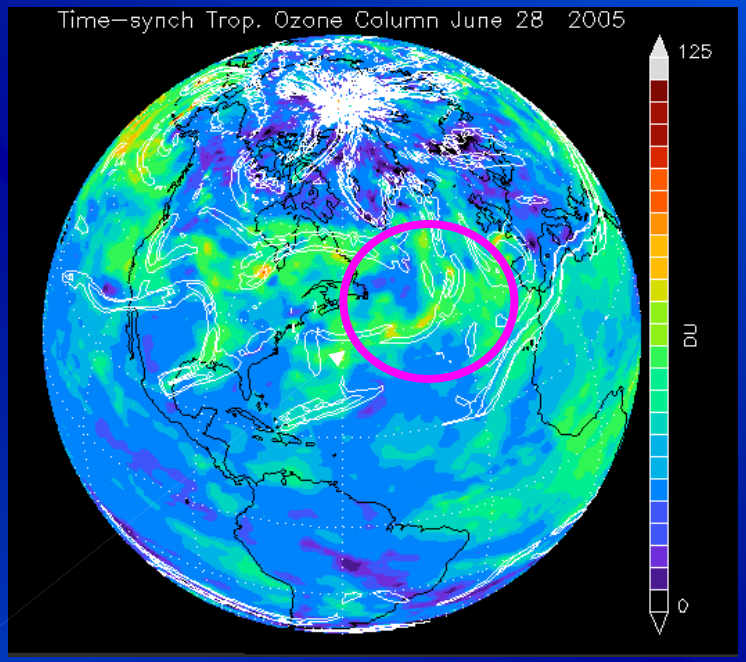
Daily product more difficult to compare

Careful time synchronization of two data sets is needed - can make a big differences near folds



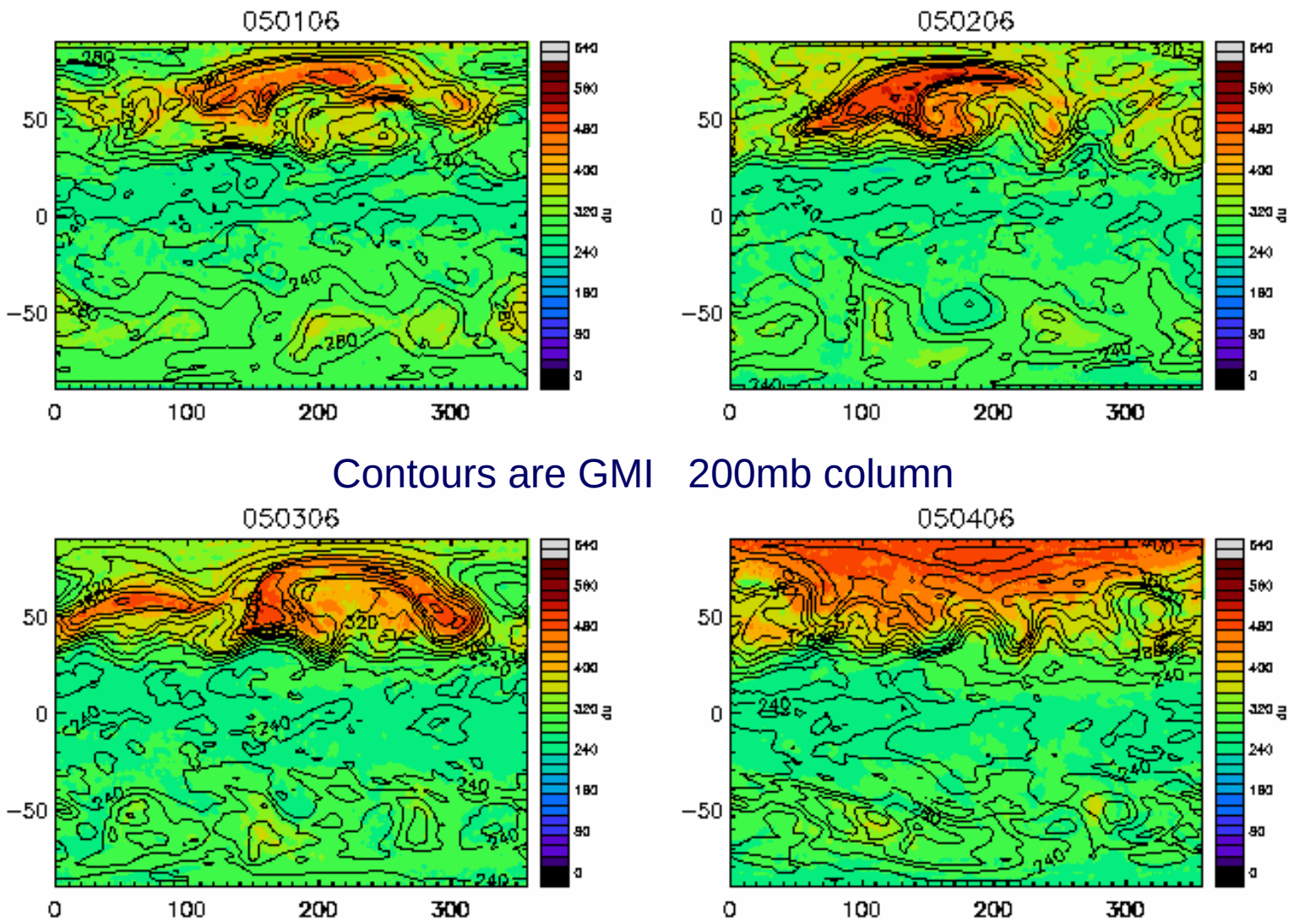
Non-time synchronized

Fold event



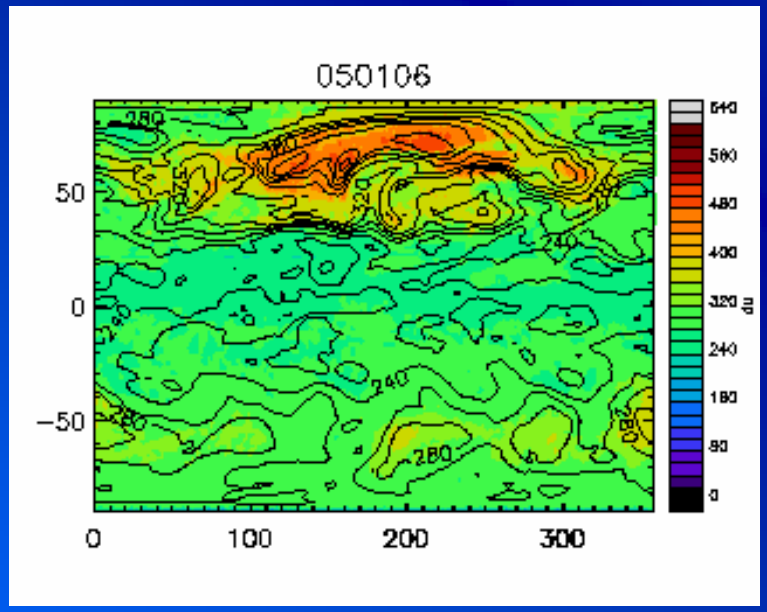
Time synchronized

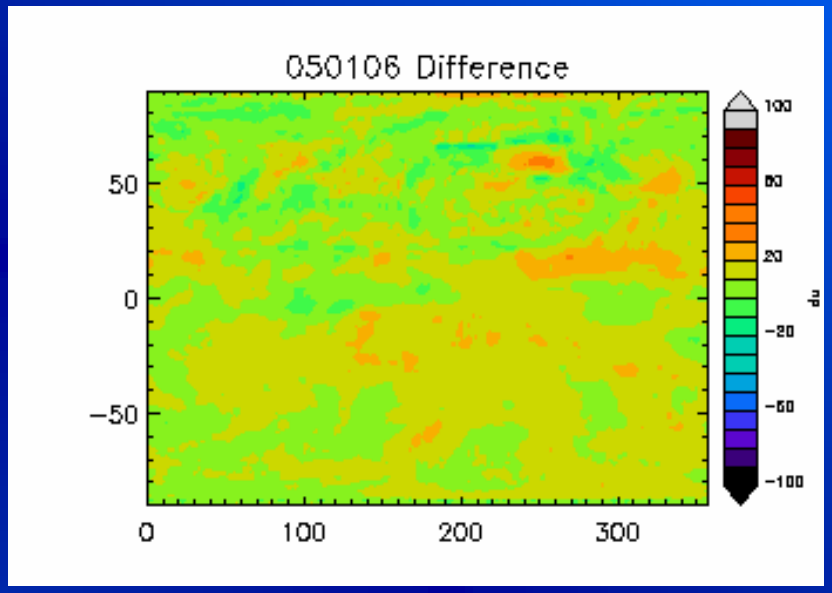
GMI- MLS O3 200mb & above column comparisons



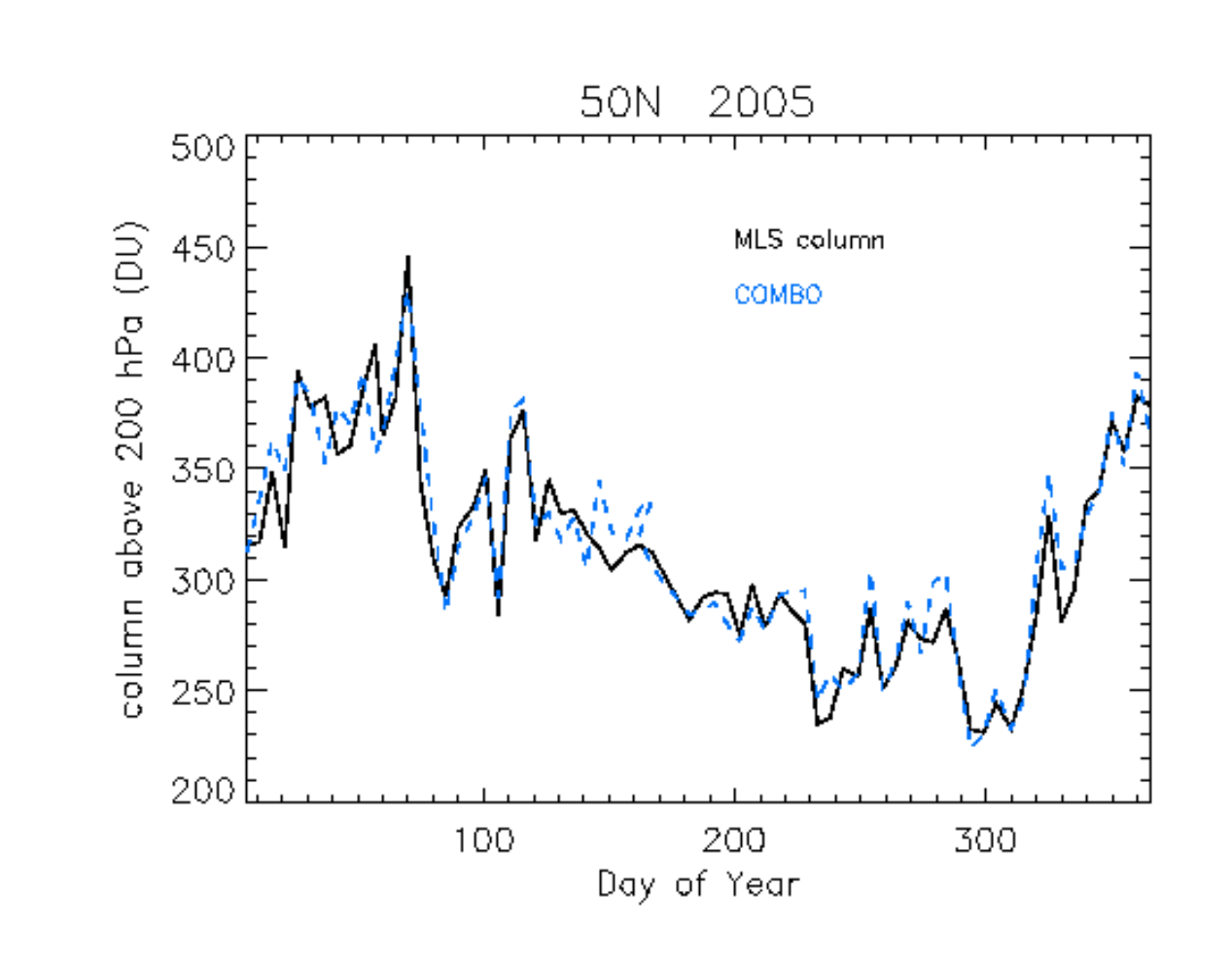
Contours are GMI 200mb column

Differences

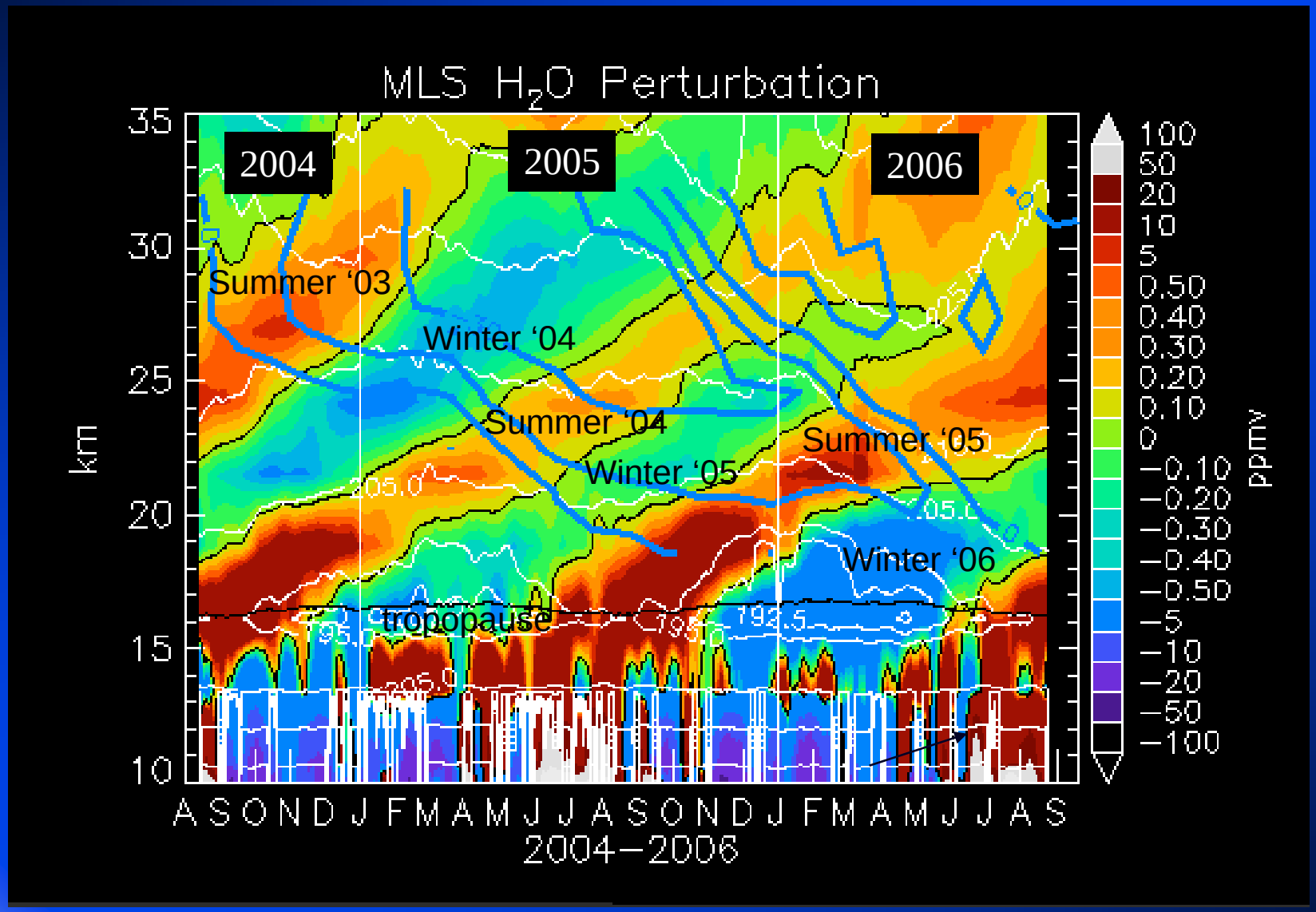




GMI- MLS O3 200mb & above column comparisons



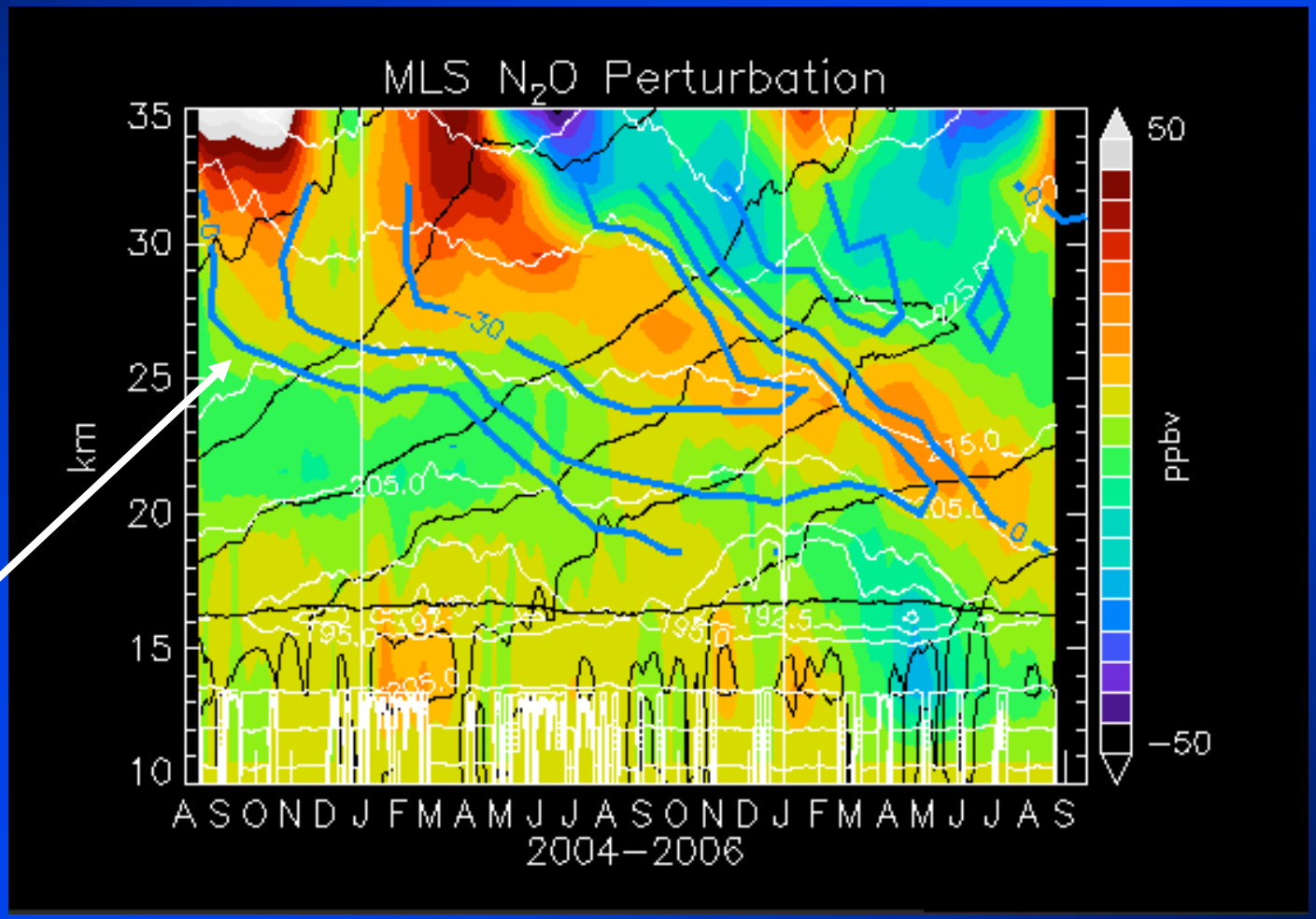
MLS Water Vapor Tape Recorder



Read et al 2004 JGR 109, D06110

QBO interaction with N_2O

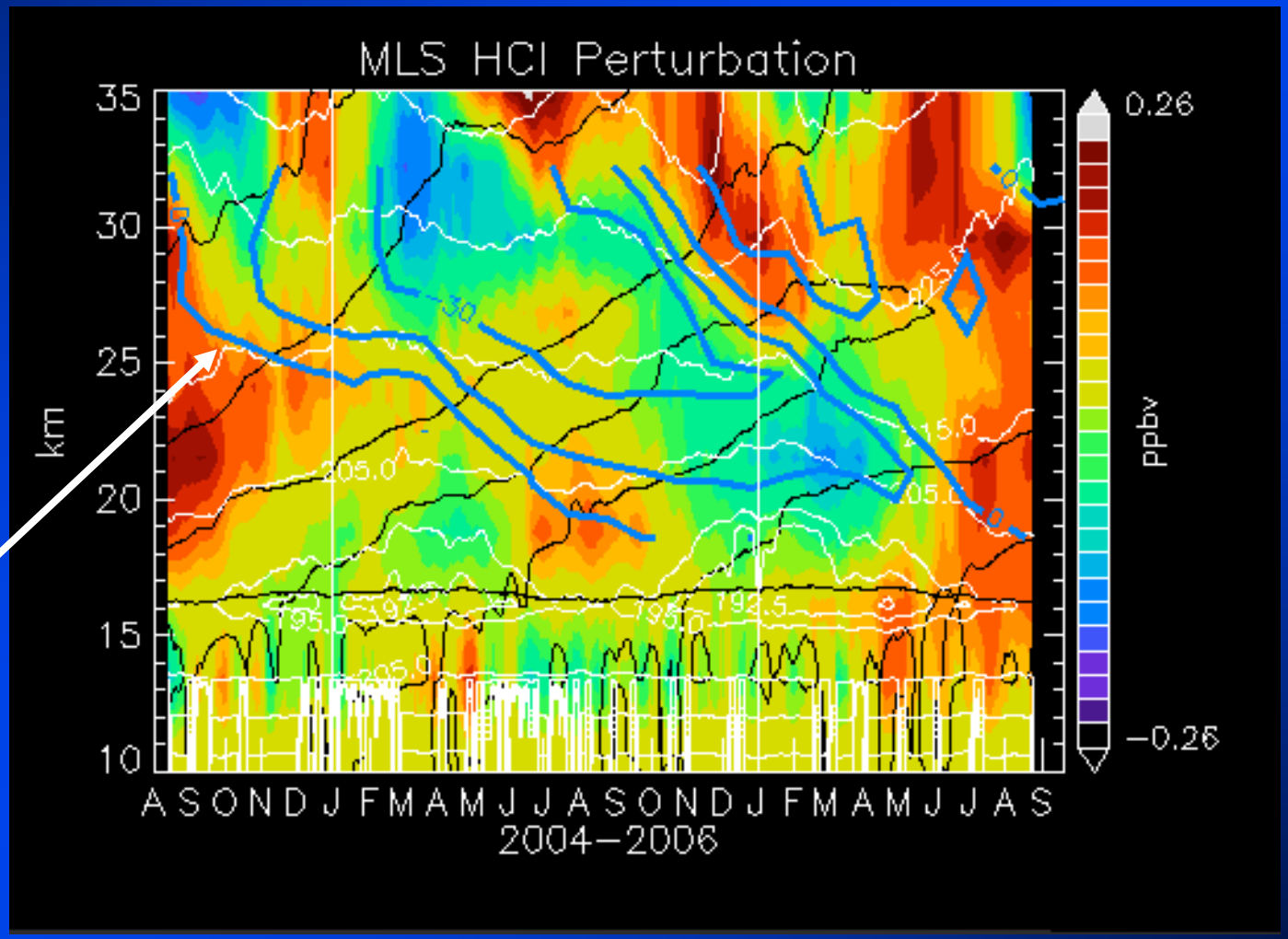
Tropical N2O with 2005 annual average subtracted



QBO Singapore winds

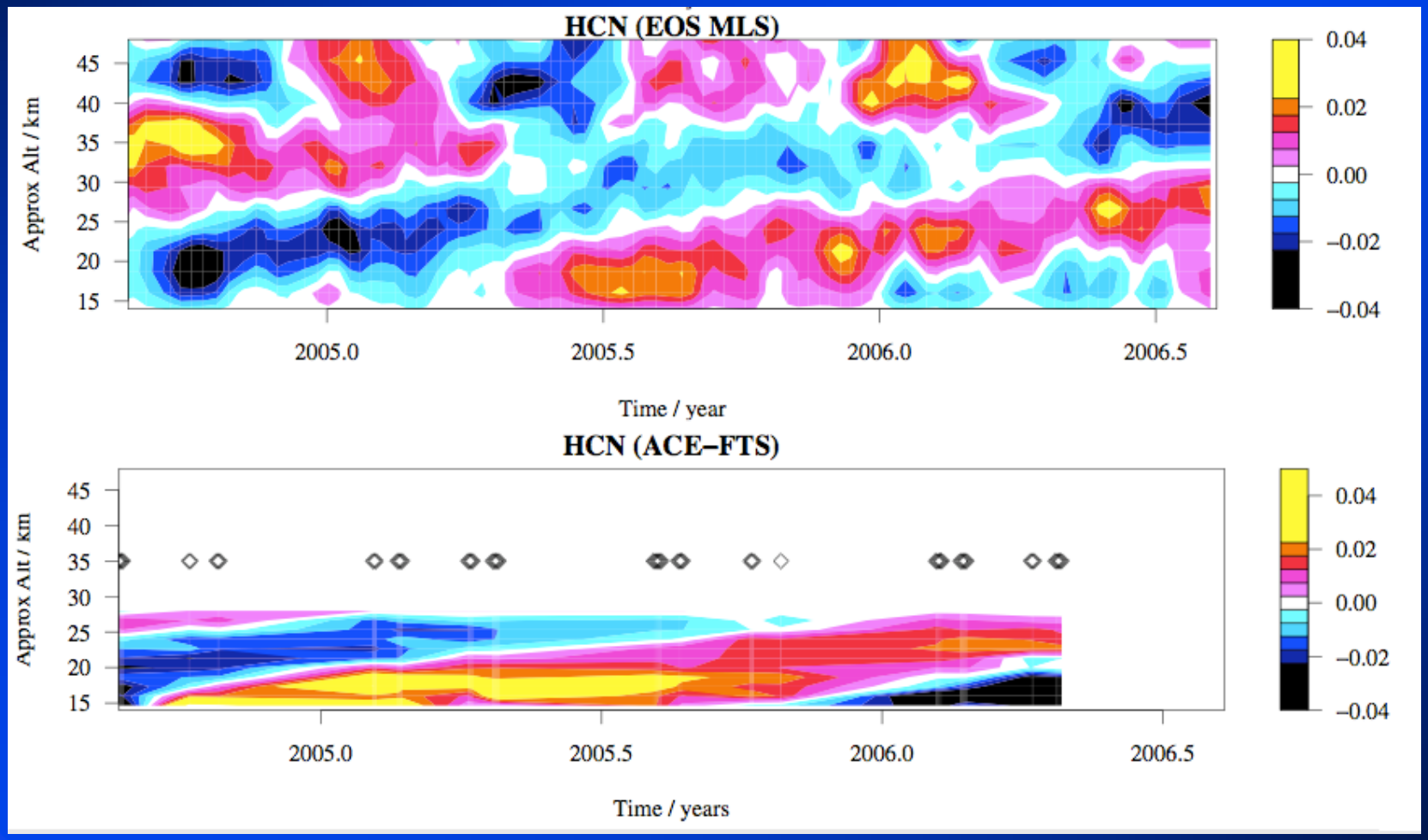
QBO and HCl

Tropical HCl with 2005 annual average subtracted



QBO
Singapore
winds

HCN Tape recorder



Hugh Pumphrey, 2006

Summary

- Aura data can be compared with GMI output to develop a science understanding of observations
  - Tropical UT/LS (tape recorder and QBO tests for many tracer)
  - >200mb O3 column and tropospheric residual
- Aura data is available on DISK (MLS, OMI, HIRDLS); TES on Langley DAAC
  - Some capable Aura readers are available on the Goddard Science System and most of the data is stored there as well
- GMI output is hard to get and hard to use (unless you know someone) and this will slow exploitation of the model
  - What is the point of this effort if no one can get the data?
  - Need to provide very useable readers and data grouping tools written in IDL
  - For the MLS, OMI and relevant ACE data set comparisons we need corresponding gridded fields for the observation periods

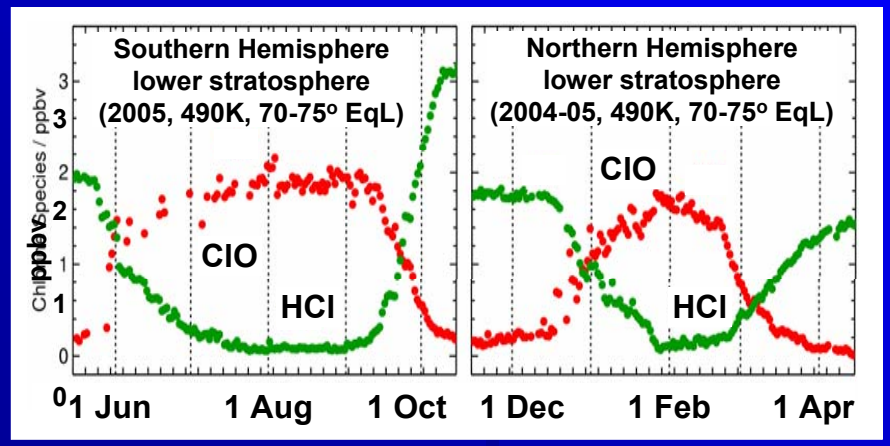
MLS: Continuous measurement of HCl in stratosphere

The continuous measurement of HCl in the stratosphere shows the rapid recovery of this major chlorine reservoir after polar ozone loss, and continues the long-term measurements from UARS HALOE

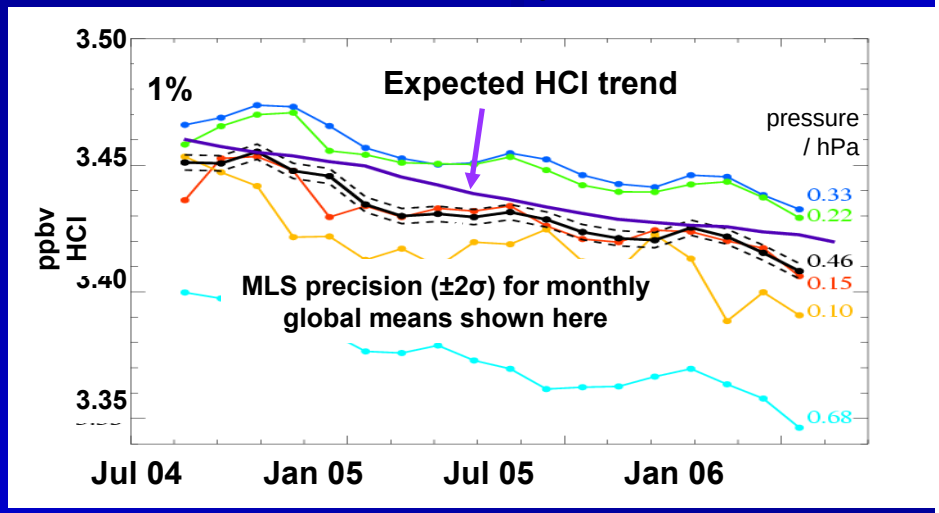
Santee et al., GRL 32, L12817, 2006;
Santee et al., to be submitted to JGR

- Decrease in upper atmospheric HCl

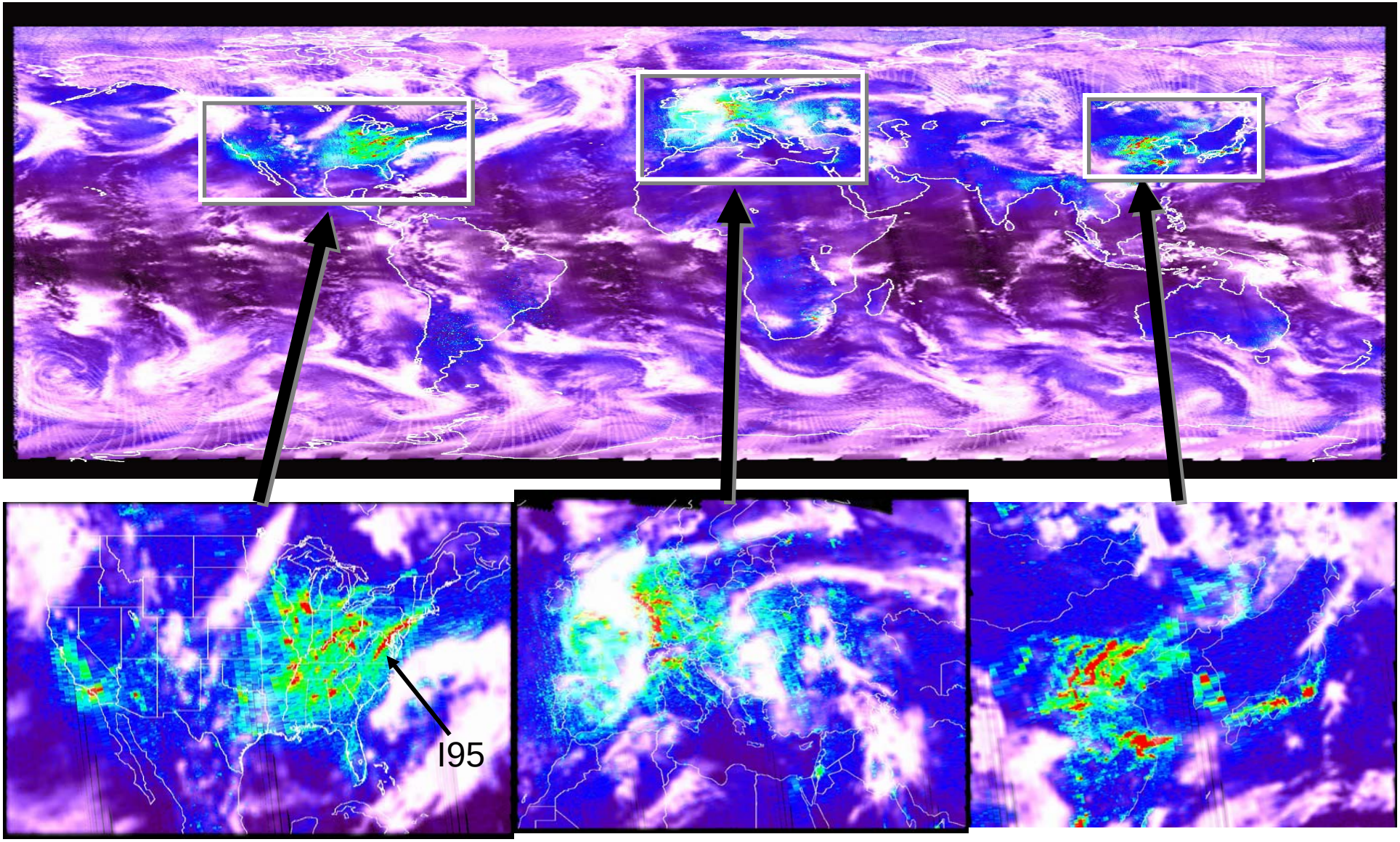
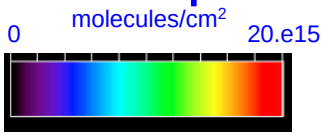
Froidevaux et al., ☐submitted to GRL



In the polar vortex regions HCl is converted to ClO which destroys ozone



HCl is slowly decreasing due to ban on CFC's



OMI Daily observations of NO_2 Images for April 15, 2004