

# Seven Slides About GEOS-5 (not including this one)

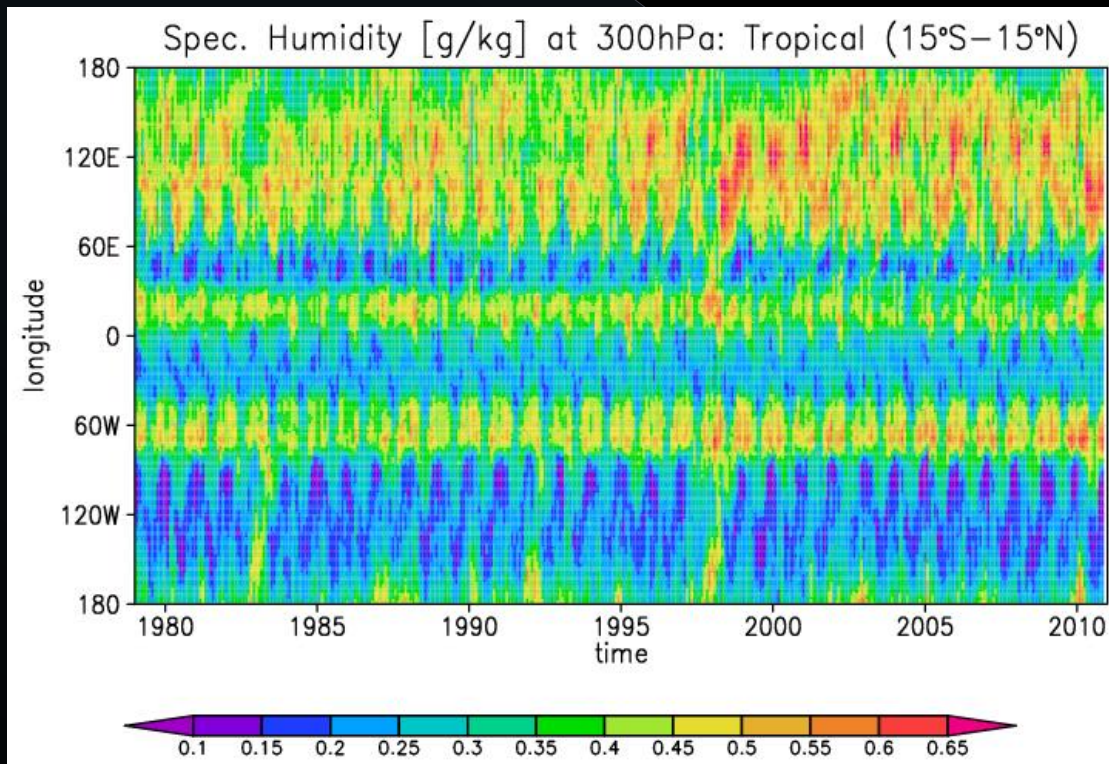
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# 1. GEOS-5.2 NRT & MERRA: 1979-...

GEOS-5.2.0 has been run in near-real time since 2008 and for the “MERRA” reanalysis (1979 onwards)

Analyses should be similar, although data streams differ

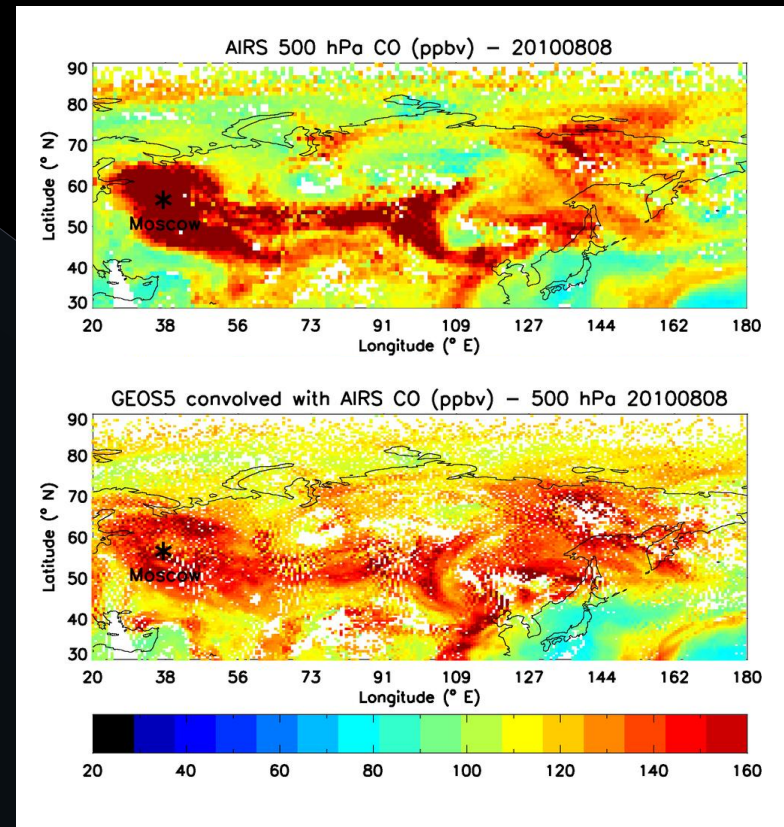


This plot illustrates how the analyses change as the available data evolves – water at 300hPa in the Tropics increases substantially after about 1997 when ATOVS began

## 2. On-Line Constituents

In 2004, in collaboration with Harvard, we ran tagged CO and some other tracers into GEOS-4 for Intex-NA  
GEOS-5 now regularly provides tagged CO, aerosols (GOCART), and other species

This plot shows GMAO's evaluation of CO in GEOS-5 at the time of the "Russian heatwave and wildfires" in August 2008 – elevated CO emissions from the wildfires are not strong enough in GEOS-5 (plot by Lesley Ott with Juying Warner)

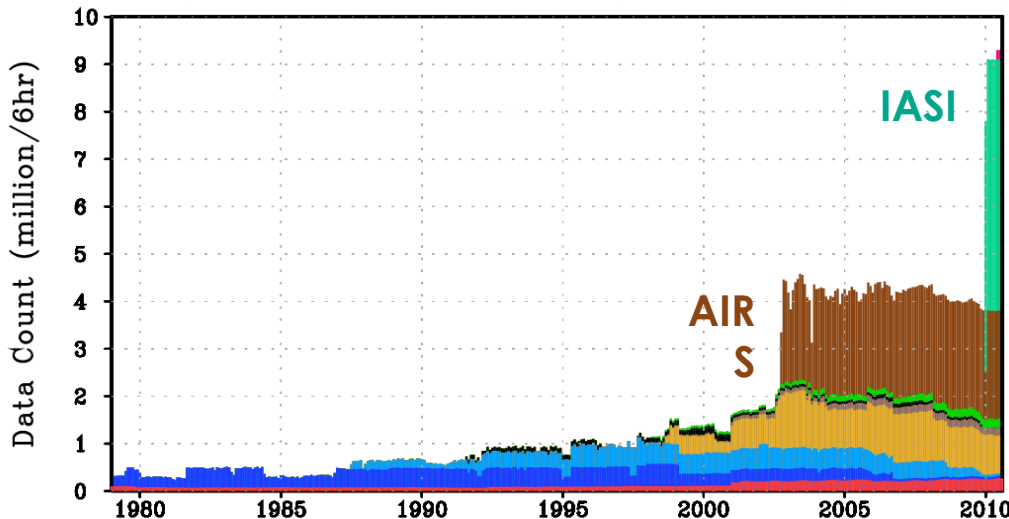


# 3. Upcoming Changes to NRT GEOS-5

Beginning in mid-June, GEOS-5.7.3 will replace GEOS-5.2.0 as our NRT system (MERRA will continue unchanged)

Resolution will be increased to  $0.25^{\circ} \times 0.3125^{\circ}$  with updates to the model and enhanced capabilities in the analysis

Number of observations processed in each six-hour window of GEOS-5

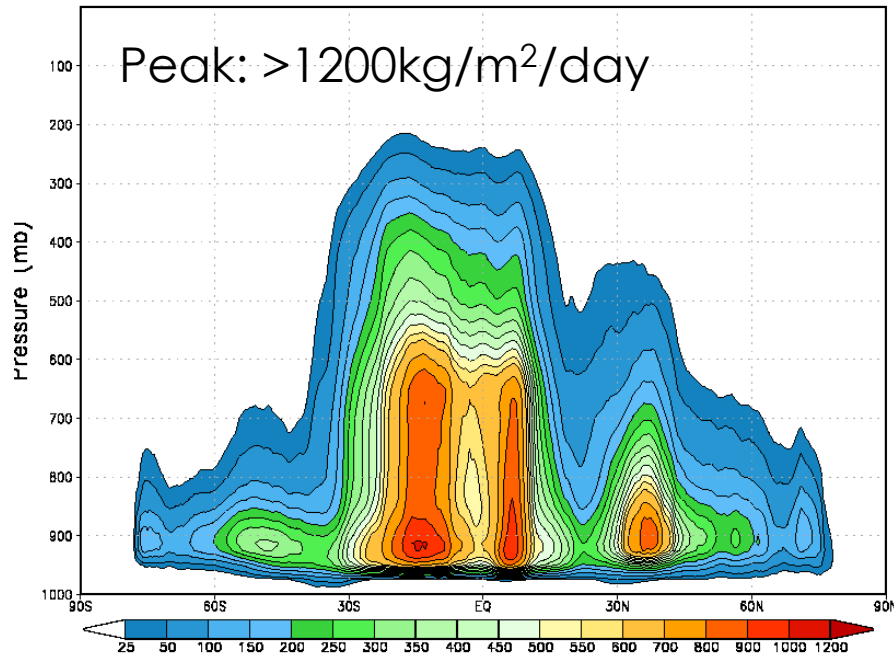


Plot by Ron Gelaro

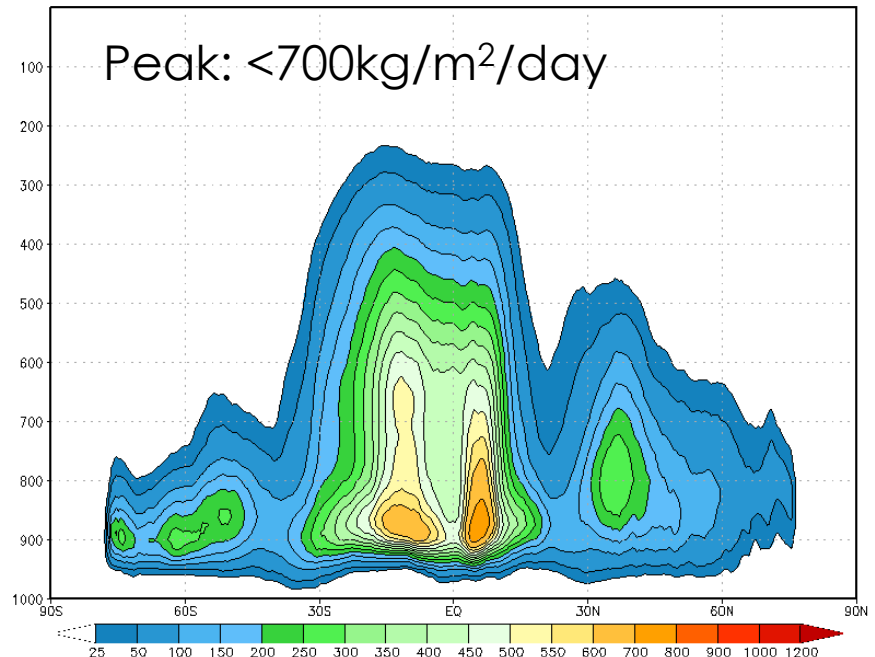
Hyperspectral sensors (AIRS & IASI) greatly increase the number of observations each analysis step. After thinning and QC, about 1/3 this number are assimilated. GEOS-5.7.3 includes IASI and GPSRO.

# 4. Convective Mass Fluxes

GEOS-5.2.0 (NRT) – 0.5°



GEOS-5.6.1 (test) – 0.25°



Results shown for January 2011

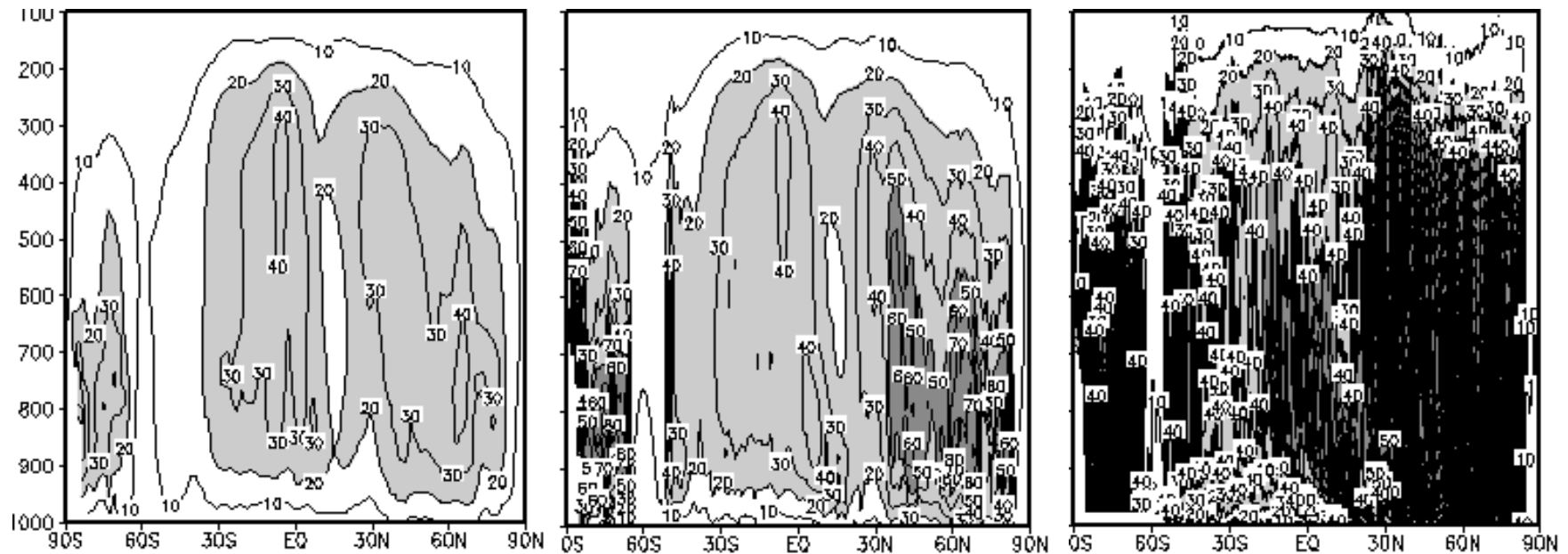
There is a large difference in the sub-grid cloud mass fluxes in these two versions of GEOS-5. While the change is caused partly by higher resolution, the main impact is from details of the Relaxed Arakawa-Schubert convection scheme (stochastic Tokioka effect suppresses deepest plumes). Thanks to Andrea Molod.

# 5. Variance of Vertical Velocity

GEOS-5.2.0  
2.0°×2.5°

GEOS-5.2.0 (MERRA)  
0.5°×0.6667°

GEOS-5.6.2  
0.25°×0.3125°



Zonal-mean of the variance of the departure from time-mean of omega

This shows how the space-time variance of large-scale vertical velocity increases with resolution in the GEOS-5.2.0 and in response to the model changes between GEOS-5.2.0 and GEOS-5.6.2. The model changes lead to the resolved dynamics contributing more to vertical heat transport.

# 6. Reduced Resolution CTMs

Issue of missing localized vertical transport in reduced-resolution CTMs was raised by Y.X. Wang et al. (2004)

GMAO will quantify contributions of resolved vertical transport ( $[\rho w' \eta']_z$ ) and the parameterized transport by cloud mass flux for several trace gases

Aim to represent “sub-grid vertical flux” in reduced-resolution CTMs in the form:

$$(\text{Sub-grid tracer flux}) \sim \kappa \times (\text{Mean tracer gradient})$$

where  $\kappa$  is function of the sub-grid variance

... although if everyone were to run GEOS-CHEM at  $1/4^\circ$  resolution, there would be no need for this!

# 7. Summary and Conclusions

MERRA provides a long time series of meteorological fields from GEOS-5 – but beware of “false trends”

“NRT” analyses evolving from GEOS-5.2.0 to GEOS-5.7.3 in middle June 2011

Draft file specs are available for comment (mid May) at [gmao.gsfc.nasa.gov](http://gmao.gsfc.nasa.gov)

Interplay between resolved and unresolved processes is important and will likely lead to changes in CTMs

Chemistry modules are implemented in GEOS-5 ...  
GEOS-CHEM column code is being added!

Please contact me ([Steven.Pawson@nasa.gov](mailto:Steven.Pawson@nasa.gov)) if you need help/advice with GEOS-5