First retrievals of tropospheric O_3 & CO from the AURA TES experiment (A33A-0119)

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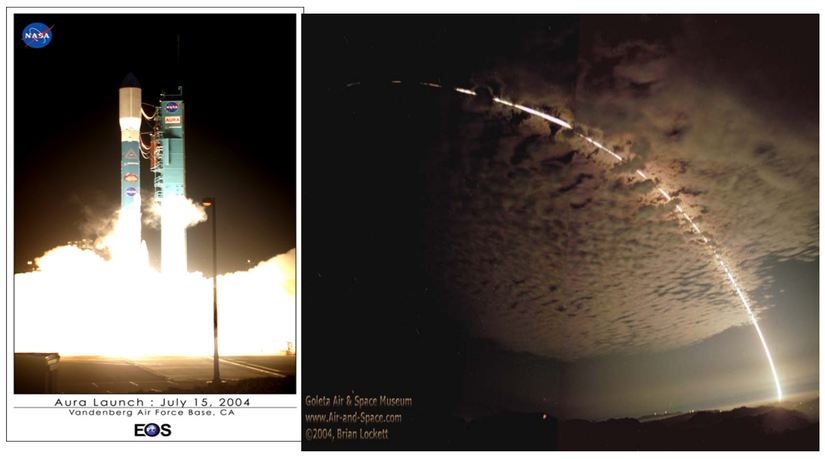
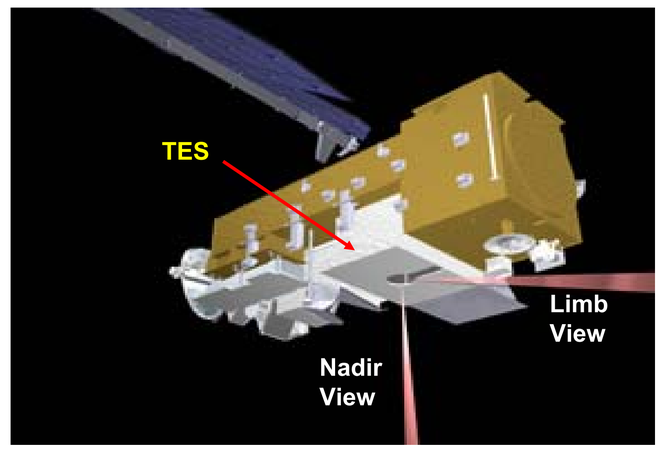
Abstract

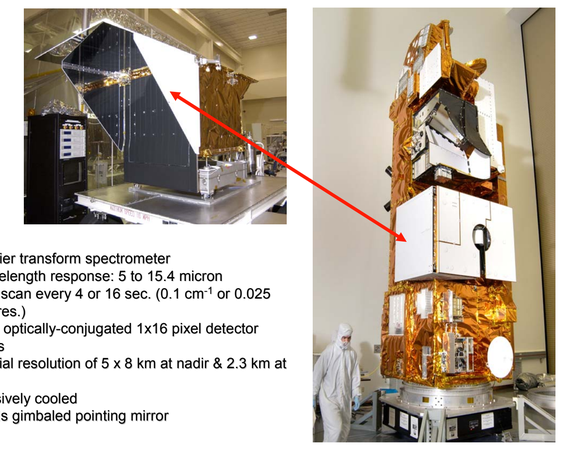
Initial retrievals of tropospheric ozone and carbon monoxide are shown, together with available intercomparisons with sondes and other instruments.



AURA Launch; 2004 July 15, 03:02 PDT



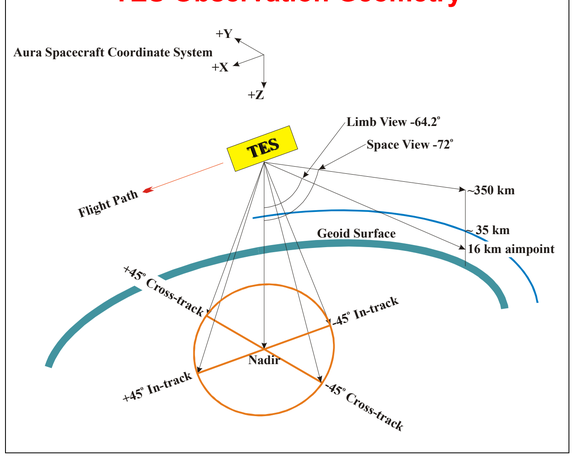
The AURA spacecraft



- Fourier transform spectrometer
- Wavelength response: 5 to 15.4 micron
- One scan every 4 or 16 sec. (0.1 cm^{-1} or 0.025 cm^{-1} res.)
- Four optically-conjugated 1x16 pixel detector arrays
- Spatial resolution of 5 x 8 km at nadir & 2.3 km at limb
- Passively cooled
- 2-axis gimbaled pointing mirror

TES specifications

TES Observation Geometry

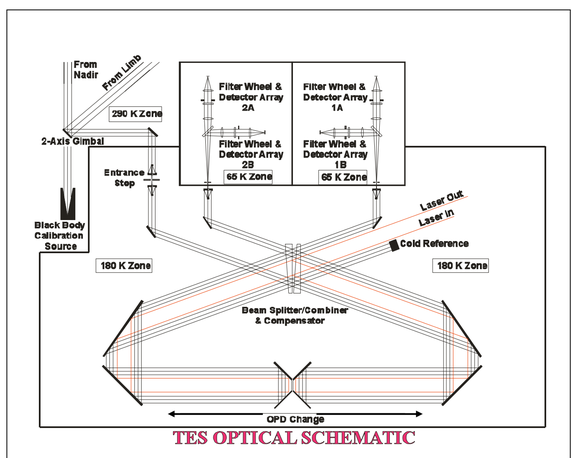


The TES Experiment

Global measurements of tropospheric ozone and its precursors from TES combined with *in-situ* data and model predictions will address the following key questions:

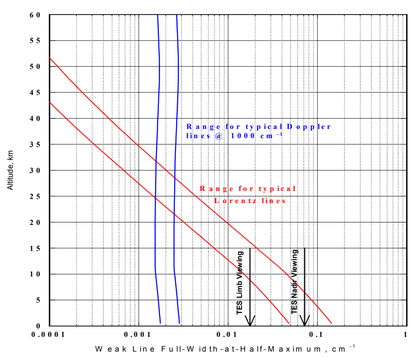
How is the increasing ozone abundance in the troposphere affecting

- ***climate change?***
- ***oxidizing reactions that "cleanse" the atmosphere?***
- ***air quality on a global scale?***



TES OPTICAL SCHEMATIC

Variation of Typical Linewidths with Altitude



TES Operating Modes

Global Survey: 16 orbits of nadir & limb observations repeated every other day. This is the source of Standard Products.

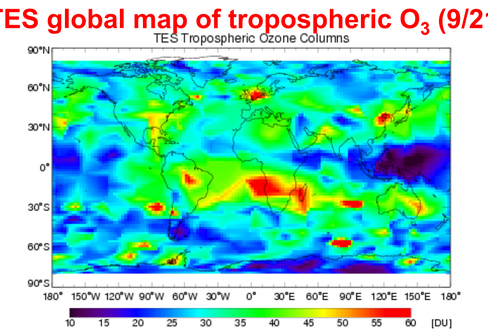
Stare: Point at a specific latitude & longitude for up to ~4 minutes.

Transect: Point at a set of contiguous latitudes & longitudes to cover ~850 km.

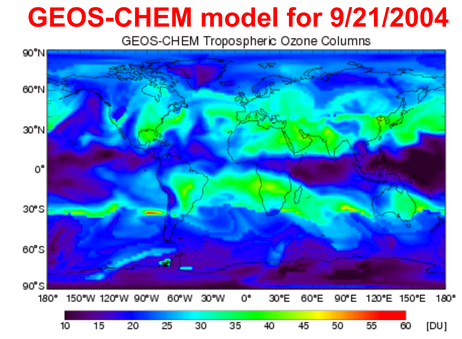
Step-&-Stare: Point at nadir for 4 seconds (5.2 seconds with necessary reset). Spacecraft has moved ~40 km. Point at nadir again. Repeat indefinitely.

These last 3 modes constitute Special Products that are obtained *only* when no Global Survey is scheduled.

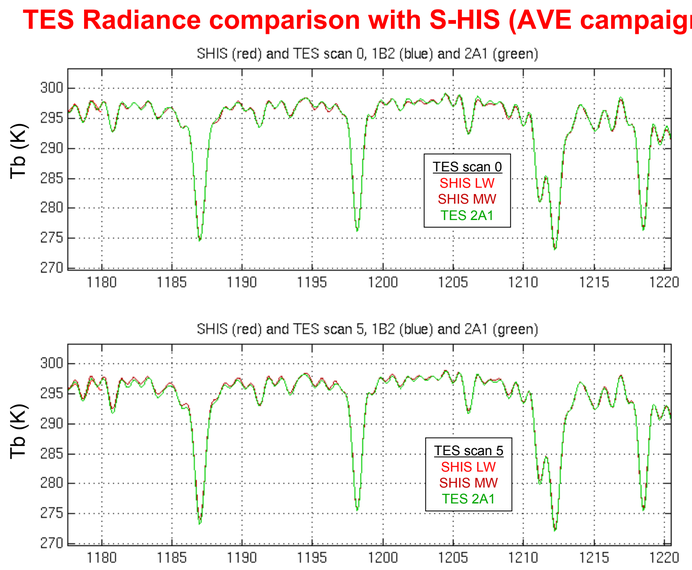
First TES global map of tropospheric O_3 (9/21/2004)



GEOS-CHEM model for 9/21/2004



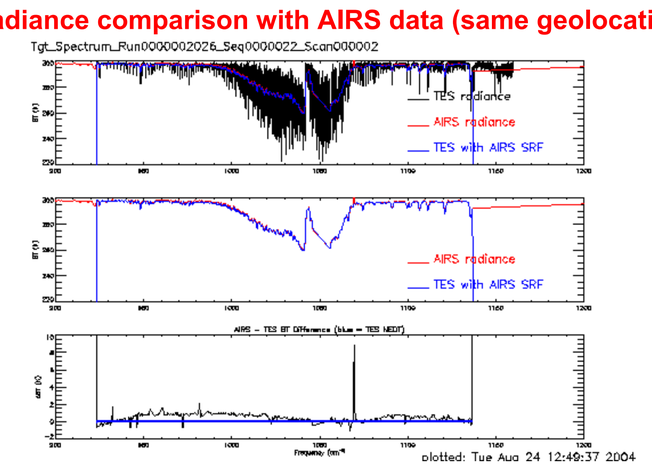
TES Radiance comparison with S-HIS (AVE campaign)



The TES Science Team (* = formal co-I)

NAME	INSTITUTION	ROLE
Reinhard Beer*	JPL	Principal Investigator
Kevin W. Bowman	JPL	L1B Algorithms
Linda R. Brown	JPL	Spectroscopy
Shepard A. Clough*	AER, Inc.	L2 Algorithms, Validation
Michael R. Gunson*	JPL	Deputy PI
Annmarie Eldering	JPL	Clouds & Aerosols
Brendan M. Fisher	JPL	L1A Algorithms, Calibration
Aaron Goldman	University of Denver	Spectroscopy
Daniel J. Jacob*	Harvard University	Tropospheric Chem. Modeling
Jennifer A. Logan*	Harvard University	Tropospheric Climatology
Mingzhao Luo	JPL	Mission Planning, L3 Products
Frank J. Murcray*	University of Denver	Correlative Measurements, Calibration
Gregory B. Osterman	JPL	Operational Support Products
David M. Rider*	JPL	Instrument Scientist, Calibration
Curtis P. Rinsland*	NASA Langley RC	Spectroscopy, Validation
Clive D. Rodgers*	Oxford University	L2 Algorithms, Validation
Stanley P. Sander*	JPL	Tropospheric Chemistry, Validation
Mark Shepherd	AER, Inc.	L2 Algorithms
Susan Sund-Kulawik	JPL	L2 Algorithms
Fredric W. Taylor*	Oxford University	Strat-Trop Exchange, Non-LTE
Helen M. Worden*	JPL	Algorithm Team Leader, Calibration
John R. Worden	JPL	L2 Algorithms

TES radiance comparison with AIRS data (same geolocation)



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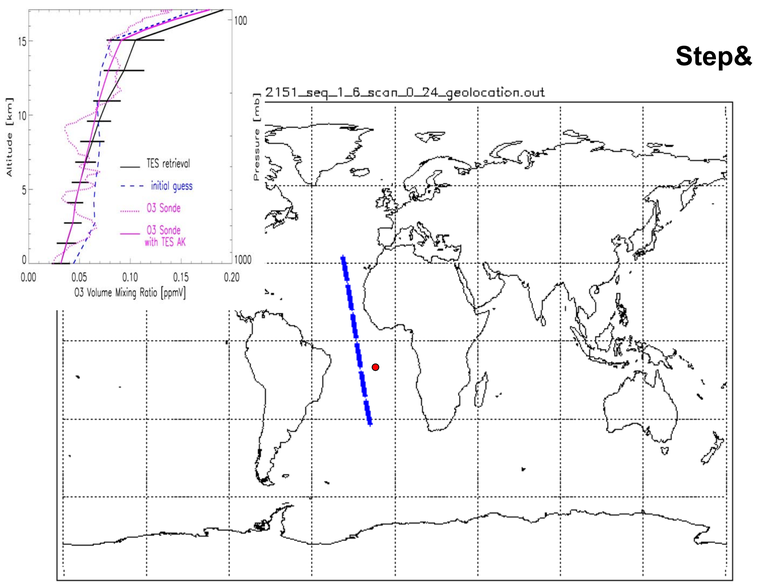
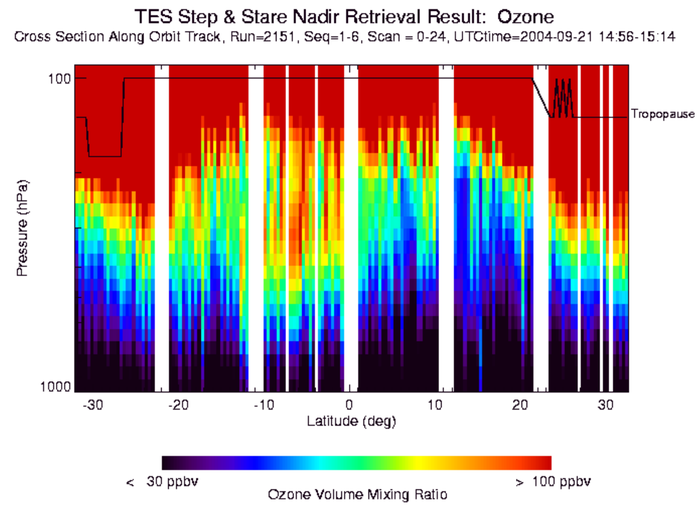
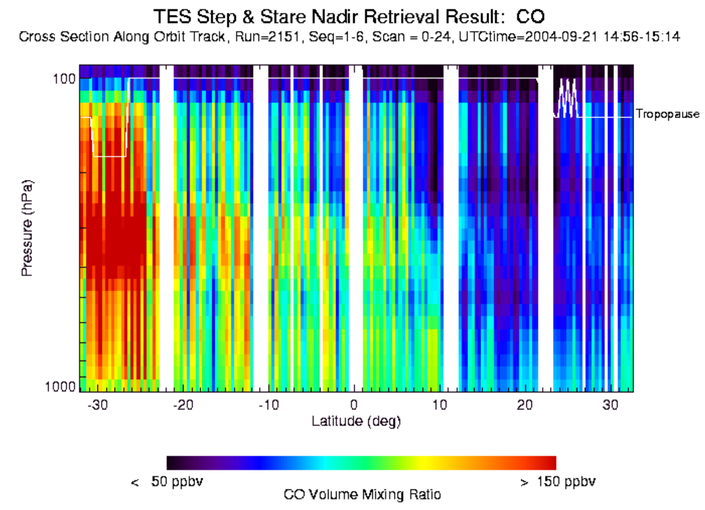
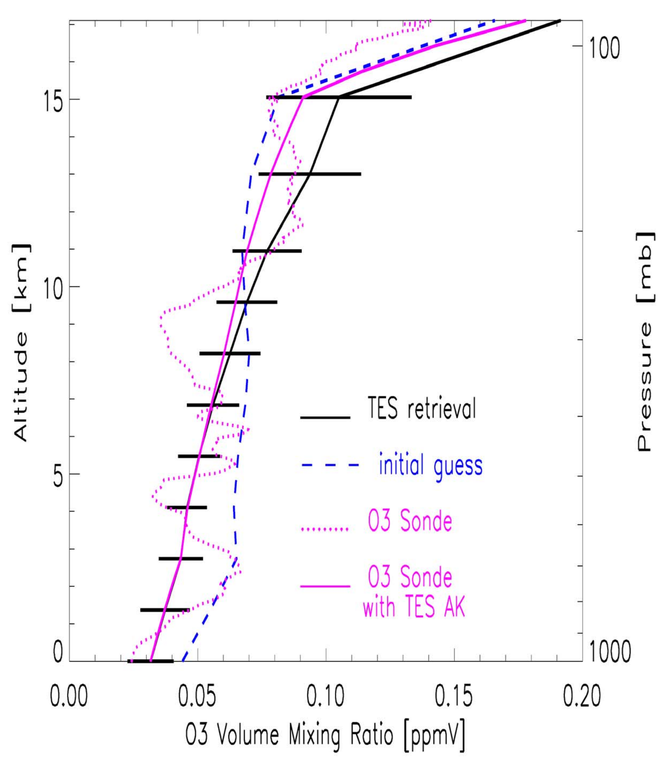


Step& Stare Mode Observation near Ascension Island (red dot); 2004 September 21

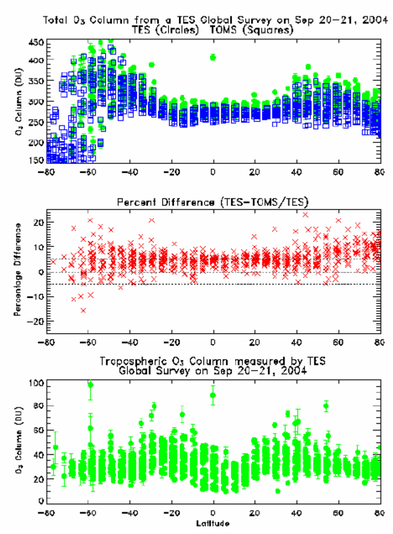




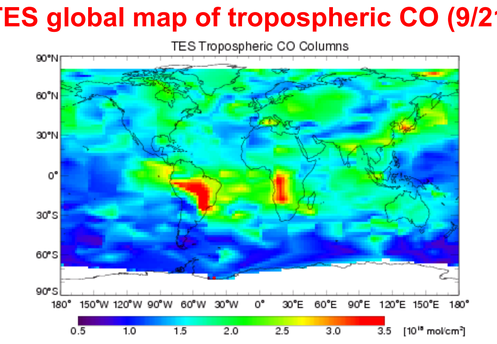
Natal, Brazil O_3 Sonde comparison to TES retrieval



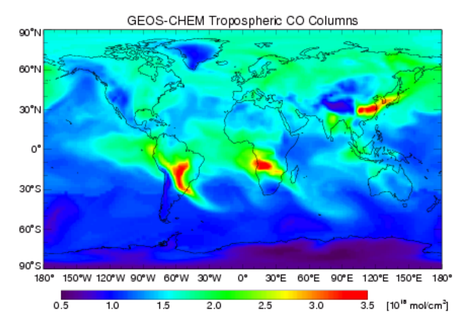
TES – TOMS Intercomparison



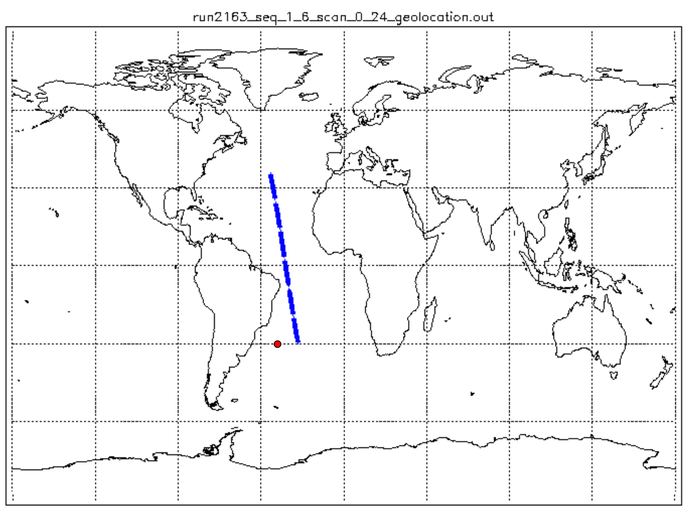
First TES global map of tropospheric CO (9/21/2004)

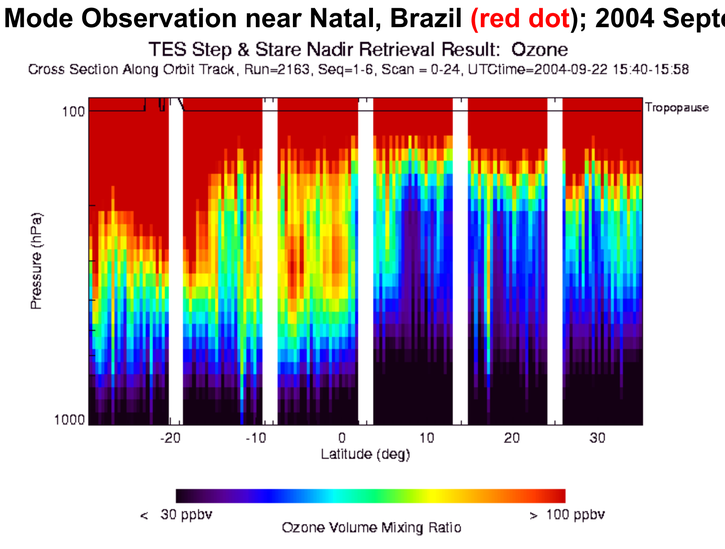


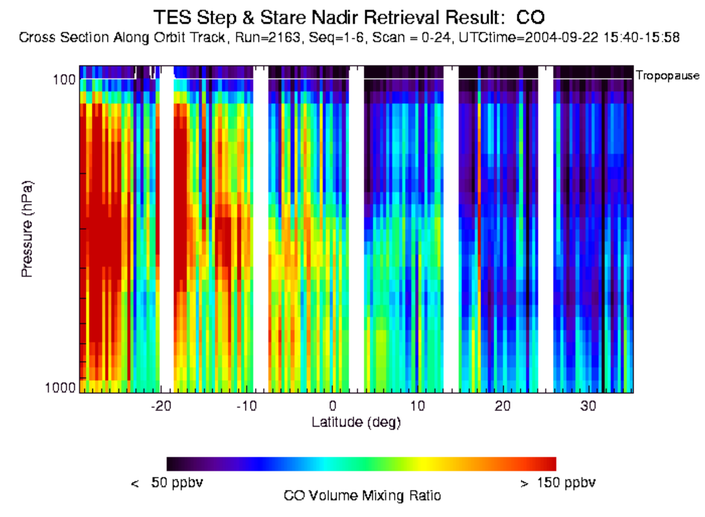
GEOS-CHEM model for 9/21/2004



Step& Stare Mode Observation near Natal, Brazil (red dot); 2004 September 22







CONCLUSION

TES is fulfilling its promise to provide the first-ever global overview of the key constituents of tropospheric chemistry and their inter-regional transport

Acknowledgements: A portion of this work was performed at the Jet Propulsion Laboratory, California Institute of Technology, under contract with NASA. The TES Science and Project teams were crucial to this work. THANKS EVERYONE!