

**Title:** Data Associated with the manuscript Using TES Retrievals to Investigate PAN in North American Biomass Burning Plumes

**Abstract:** Peroxyacyl nitrate (PAN) is a critical atmospheric reservoir for nitrogen oxide radicals, and it plays a lead role in their redistribution in the troposphere. We analyze new Tropospheric Emission Spectrometer (TES) PAN observations over North America during July 2006 to 2009. Using aircraft observations from the Colorado Front Range, we demonstrate that TES can be sensitive to elevated PAN in the boundary layer (~750 hPa) even in the presence of clouds. In situ observations have shown that wildfire emissions can rapidly produce PAN, and PAN decomposition is an important component of ozone production in smoke plumes. We identify smoke-impacted TES PAN retrievals by co-location with NOAA Hazard Mapping System (HMS) smoke plumes. Depending on the year, 15 – 32 % of cases where elevated PAN is identified in TES observations (retrievals with DOF > 0.6) overlap smoke plumes during July. Of all the retrievals attempted in July 2006 to July 2009, the percent associated with smoke is 18%. A case study of smoke transport in July 2007 illustrates that PAN enhancements associated with HMS smoke plumes can be connected to fire complexes, providing evidence that TES is sufficiently sensitive to measure elevated PAN several days downwind of major fires. Using a subset of retrievals with TES 510 hPa carbon monoxide (CO) > 150 ppbv, and multiple estimates of background PAN, we calculate enhancement ratios for tropospheric average PAN relative to CO in smoke-impacted retrievals. Most of the TES-based enhancement ratios fall within the range calculated from in situ measurements.

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**Location where data were collected:** Satellite data covering the region: 125° W - 70° W, 30° N – 50° N and 130° W - 65° W, 50° N – 70° N.

**Time period during which data were collected:** 2006-07-01 – 2009-07-31

**File Information:** The attached dataset contains the latitude, longitude, time, Sounding ID, HMS smoke overlap status, tropospheric average and maximum TES PAN and TES CO, and 510 hPa TES CO used in Fischer et al. [2018]. See abstract and publication related to this dataset.

**Definition of acronyms:**

TES: Tropospheric Emission Spectrometer

PAN: Peroxyacyl nitrate

CO: Carbon monoxide

ppb: parts per billion

hPa: hectoPascal

HMS: Hazard Mapping System

**Variable Information:**

Date: YYYYMMDD

Hour: Hours in Local Time

Longitude: decimal degrees W

Latitude: decimal degrees N

SoundingID: TES retrieval ID number

HMS\_Smoke\_Overlap: FALSE indicates no overlap for a given TES retrieval with a HMS smoke polygon; TRUE indicates the TES retrieval did overlap with a HMS smoke polygon; NA indicates no information

TES\_PAN\_trop\_avg\_ppb: TES PAN tropospheric average (i.e. the average PAN between 800 hPa and the tropopause in parts per billion)

TES\_CO\_trop\_avg\_ppb: TES CO tropospheric average (i.e. the average CO between 800 hPa and the tropopause in parts per billion)

TES\_PAN\_trop\_max\_ppb: TES PAN tropospheric max (i.e. the maximum PAN between 800 hPa and the tropopause in parts per billion)

TES\_CO\_trop\_max\_ppb: TES PAN tropospheric max (i.e. the maximum PAN between 800 hPa and the tropopause in parts per billion)

TES\_CO\_510\_hPa\_ppb: TES CO at 510 hPa

**Uncertainty:** See the following reference for a complete description of uncertainty in TES PAN

Payne, V. H., Alvarado, M. J., Cady-Pereira, K. E., Worden, J. R., Kulawik, S. S., and Fischer, E. V.: Satellite observations of peroxyacetyl nitrate from the Aura Tropospheric Emission Spectrometer, *Atmos. Meas. Tech.*, 7, 3737-3749, <https://doi.org/10.5194/amt-7-3737-2014>, 2014.

**Environmental of experimental conditions:** N/A

**Methods:** See the following references

Payne, V. H., Alvarado, M. J., Cady-Pereira, K. E., Worden, J. R., Kulawik, S. S., and Fischer, E. V.: Satellite observations of peroxyacetyl nitrate from the Aura Tropospheric Emission Spectrometer, *Atmos. Meas. Tech.*, 7, 3737-3749, <https://doi.org/10.5194/amt-7-3737-2014>, 2014.

Fischer, E. V., Zhu, L., Payne, V. H., Worden, J. R., Jiang, Z., Kulawik, S. S., Brey, S., Hecobian, A., Gombos, D., Cady-Pereira, K., and Flocke, F.: (2018) Using TES Retrievals to Investigate PAN in North American Biomass Burning Plumes, *Atmos. Chem. Phys.*, <https://doi.org/10.5194/acp-18-1-2018>.

**Quality assurance:**

See the following reference

Payne, V. H., Alvarado, M. J., Cady-Pereira, K. E., Worden, J. R., Kulawik, S. S., and Fischer, E. V.: Satellite observations of peroxyacetyl nitrate from the Aura Tropospheric Emission Spectrometer, *Atmos. Meas. Tech.*, 7, 3737-3749, <https://doi.org/10.5194/amt-7-3737-2014>, 2014.

**Limitations to reuse:** None

**Date dataset was last modified:** There are not multiple versions of this dataset