Aura TES Ozone Validation Comparisons, 2004-2016

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Overview

- 12 years of comparisons of Aura TES v006 ozone retrievals with ground truth (ozonesonde measurements) for 2004 through 2016.
- Matching criteria: 9 h and 300 km coincidence matching. For year-to-year consistency, limit matches to latitudes 30 S to 50 N.
- New range for allowed quality flag: 0.5<radiance_residual_rms<2.0.
- TES averaging kernel is applied to the ozonesonde profiles for comparisons, using the method described in Worden et al. (2007).
- Plots show percent difference in ozone of TES minus ozonesonde with averaging kernel. TES error (cyan dashed line), bias (blue line) and bias ±rms (black lines) are shown.

Previous validation work

- Verstraeten et al. (2013): 2005-2010 comparisons with WOUDC indicate TES v004 ozone retrievals biased high by 2-7 ppbv (7-15%) in the troposphere. This paper also concluded that v004 TES ozone biases do not appear to depend on location or season.
- Nassar et al. (2008) concluded that v002 TES ozone biases do not appear to depend on location or season.
- Worden et al. (2007) initial validation of TES ozone.

Ozonesonde sources

- WOUDC global database

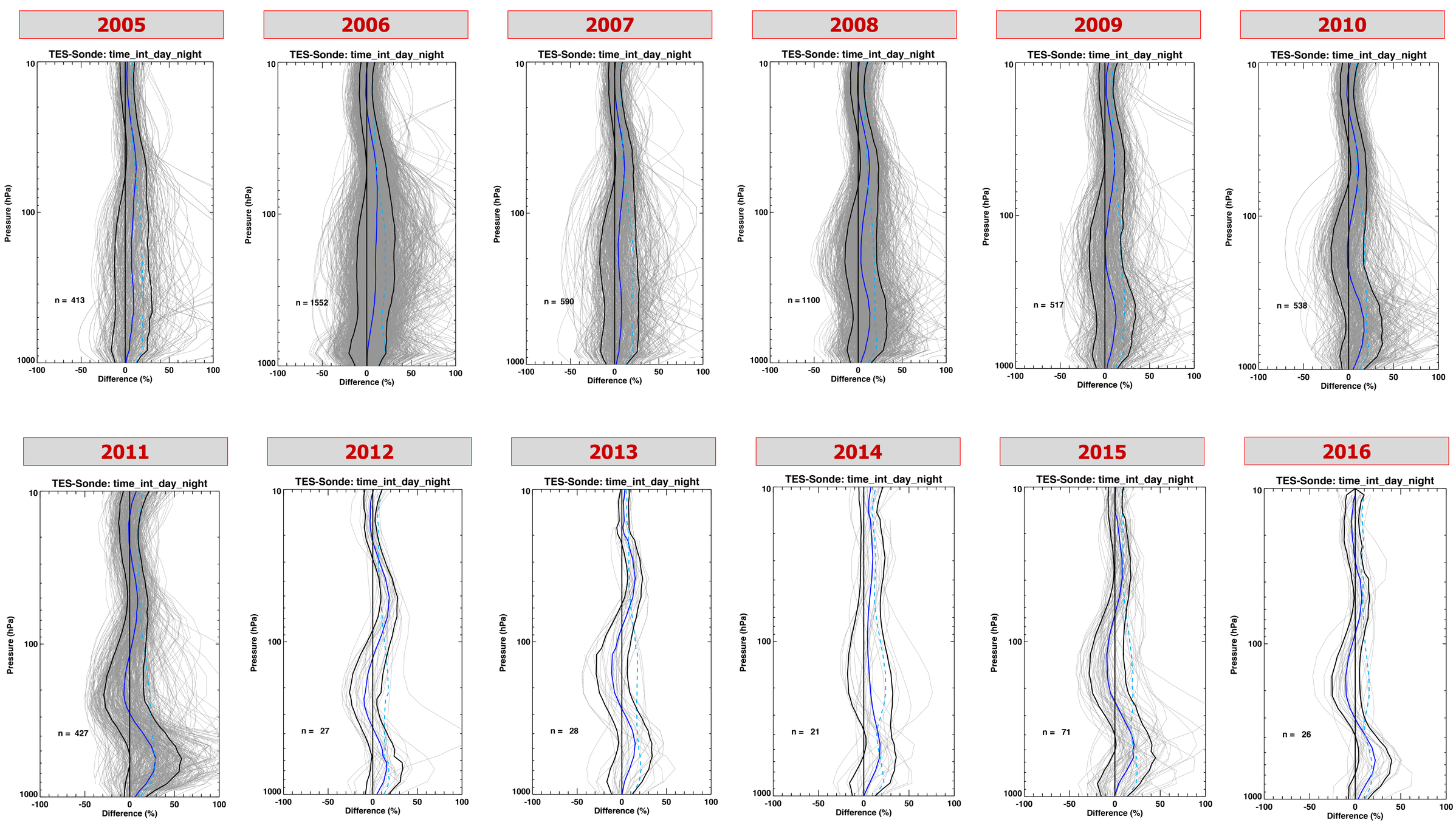
(http://woudc.org/archive/Archive-NewFormat/OzoneSonde_1.0_1),

- NOAA ESRL stations, with special ozonesonde launches coordinated with Aura TES overpass (esp. 2015-2016):
  - Hilo, HI (19.7 N. 155.0 W, 10 m ASL)
  - Trinidad Head, CA (41.06 N, 124.15 W, 36 m ASL).

Summary

- Aura TES has a high-quality long-term data record of tropospheric ozone.
- TES v006 ozone retrievals are biased high in the troposphere by 2-16% with the exception of 2011 (outliers in Jan 2011 under investigation).
- TES ozone bias is characterized for the lower troposphere (1000-500 hPa), and the upper troposphere (500-270 hPa) in the statistics table below:
- Future work is a validation analysis similar to Verstraeten et al. (2013) for v007 TES ozone data.

Year	Range	Bias	# profiles	Year	Range	Bias	# profiles
2004	LT	7.8%	73	2010	LT	12.8%	538
2004	UT	5.8%	73	2010	UT	11.5%	538
2005	LT	5.1%	413	2011	LT	21.0%	427
2005	UT	9.2%	413	2011	UT	12.2%	427
2006	LT	2.5%	1552	2012	LT	11.6%	27
2006	UT	8.7%	1552	2012	UT	0.2%	27
2007	LT	5.3%	590	2013	LT	7.2%	28
2007	UT	7.4%	590	2013	UT	9.4%	28
2008	LT	9.4%	1100	2014	LT	10.4%	21
2008	UT	10.2%	1100	2014	UT	14.5%	21
2009	LT	7.6%	517	2015	LT	10.5%	71
2009	UT	9.9%	517	2015	UT	14.5%	71
				2016	LT	14.6%	26
				2016	UT	8.1%	26



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