TROPESS Ozone
Level 2 Summary Data Product User Guide

Kevin Bowman[1], John Worden[1], Greg Osterman[1], Vivienne Payne[1], Susan Kulawik[2],, Sirvard Akopyan[1], Valentin Kantchev[1] and Kristen Fahy[1]

[1] Jet Propulsion Laboratory, California Institute of Technology
[2] NASA Ames Research Center

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1 Introduction

1.1 Overview and Document Scope

This document is to be used as a Quick start user guide for using the TROPESS Ozone Level 2 Summary Product Files.

1.2 Dataset Description

This user guide describes the TROPESS Level 2 Summary product files for ozone (O_3).

Table 1. Dataset Description

Product Information	Description
Parameters	See Table 2, in section 2.1
Data Product Provenance	Refer to ReadMe document, section 1.3.4 Algorithm Version
Approximate file size	8 MB CrIS, 6 MB AIRS, 4MB OMI
Spatial coverage	Regular collections have global coverage: Nominal latitude range: 70 N to 50 S Nominal longitude range: -180 to 180 Special collections: Spatial coverage varies by collection
Temporal coverage	Each L2 nominal Summary file contains one day of data
File format	NetCDF
Vertical sensitivity	The ozone profiles typically have sensitivity between approximately 800 hPa and the upper stratosphere. There is sensitivity in the retrievals to ozone in the troposphere, often around 0.8-1.2 degrees of freedom
Data quality	The data have undergone a pre-quality check, which involves checks for retrieval convergence. There are no checks for clouds or land versus ocean as we do not find these to substantively affect the quality of the retrieval as long as the retrieval has converged. The ozone data has undergone preliminary validation by comparison to ozonesondes, with a much more thorough evaluation currently underway
Uncertainty	Uncertainties on vertically-averaged ozone values between 300 and 750 hPa are estimated to vary between 0.2-0.9 ppb for a single sounding.
Validation Stage	Stage 1 according to NASA guidelines https://science.nasa.gov/earth-science/earth-science-data/data-maturity-levels
Retrieval Levels	26 levels: from surface to top-of-atmosphere
FillValues	-999

Retrieval terminology	Retrieval terminology is defined in TES ATBD TROPESS_ATBDv1.1.pdf (nasa.gov)

1.3 Filename

The Summary Products adhere to the following filename convention:

[ProjectID]_[Instrument-Platform]_[ProductLevel]_[ProductType]_[ProductName]_[DateStamp]_[AlgorithmName]_[AlgorithmVersion]_[ProcessingStrategy]_[FormatVersion]**.**nc

Example:

```
TROPESS_CrIS-SNPP_L2_Summary_O3_20200912_MUSES_R1p9_FS_F0p1.nc
```

2 Product File Contents and Parameter Description

2.1 Variables listed in the Summary Product

All data fields in ozone summary products are shown in Table 2.

Table 2. Data Fields

Data Field Name	Long_Name/Description	Type	Dimensions	Undefined Value	Units
longitude	longitude of earth view target center	float	target	-999.0	degrees_east
latitude	latitude of earth view target center	float	target	-999.0	degrees_north
time	Earth view target mid time as International	double	target	-999.0	seconds since 1993-01-01

Data Field Name	Long_Name/Description	Type	Dimensions	Undefined Value	Units
	Atomic Time (TAI) seconds since 1993-01-01 00:00:00				00:00:00
datetime_utc	UTC expressed as an array of integers year, month, day, hour, minute, second	int	target, datetime_utc_dim	-999	1
year_fraction	Year plus fraction of the year	double	target	-999.0	year
altitude	Altitude at each target	float	target, level	-999.0	m
pressure	Atmospheric pressure used for retrieval at each target.	float	target, level	-999.0	hPa
target_id	Unique id that identifies observations across all product files.	long	target	-999	1
x	Volume mixing ratio (VMR) of Ozone relative to dry air	float	target, level	-999.0	1
xa	A priori profile, as volume mixing ratio (VMR) relative to dry air	float	target, level	-999.0	1
col	Vertically integrated ozone total column	double	target	-999	mol m-2

Data Field Name	Long_Name/Description	Type	Dimensions	Undefined Value	Units
col_error	Observational uncertainty of the vertically integrated ozone total column	double	target	-999	mol m-2
col_dry_air	Vertically integrated dry air total column	double	target	-999	mol m-2
col_t	Vertically integrated ozone tropospheric column	double	target	-999	mol m-2
col_ut	Vertically integrated ozone upper tropospheric column	double	target	-999	mol m-2
day_night_flag	If observation occurs during the day then equal to 1, otherwise equal to 0	Int64	target	-999	N/A
land_flag	If observation occurs over land then equal to 1, otherwise equal to 0	Int64	target	-999	N/A

3 References

The following references were used in the development of this documentation and should be cited if you intend to use these data:

1. Fu, D. et al., Retrievals of tropospheric ozone profiles from the synergism of AIRS and OMI: methodology and validation, ***Atmos. Meas. Tech.***, doi:10.5194/amt-11-5587-2018, 2018.

2. Boxe, C.S., et al., Validation of northern latitude Tropospheric Emission Spectrometer stare ozone profiles with ARC-IONS sondes during ARCTAS: sensitivity, bias and error analysis, ***Atmospheric Chemistry and Physics***, doi:10.5194/acp-10-9901-2010, 2010.

3. Nassar, R., Logan, J. A., Worden, H. M., et al.: Validation of Tropospheric Emission Spectrometer (TES) nadir ozone profiles using ozonesonde measurements, ***J. Geophys. Res.***, 113, D15S17, doi:10.1029/2007JD008819, 2008.

4 Validation Summary

See L2 Standard Products User's Guide for Validation Summary.

1. Appendix A. Bias correction and quality flags

The data in the L2 Summary Products have been pre-filtered for quality. See L2 Standard Product Use's guides for definitions.

2. Appendix B. Retrieval levels

The table below contains the nominal retrieval levels. For each sounding, the surface pressure level is inserted into the retrieval levels set. Any retrieval levels below the surface pressure level are omitted.

Index	Pressure [hPa]
1	1040.00
2	1000.00
3	825.402
4	681.291
5	562.342
6	464.16
7	383.117
8	316.227
9	261.016
10	215.444
11	161.561
12	121.152
13	90.8518
14	68.1295

Index	Pressure [hPa]
15	51.0896
16	38.3119
17	28.7299
18	21.5443
19	16.1560
20	12.1153
21	9.08514
22	6.81291
23	4.64160
24	1.61560
25	0.681292
26	0.10000

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