SCIAMACHY NO MLT Data ReadMe

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1. Introduction

Numerical results of nitric oxide (NO) data derived from the mesosphere/lower thermosphere (MLT) limb mode of SCIAMACHY are provided in netCDF format. This document contains descriptions of the data itself, the units used, and the netCDF format used. The retrieval procedure is described in [1]. Validation of the data set is described in [2].

The MLT limb mode provides data approximately every 15 days between August 2008 and April 2012 in the altitude range 65-150 km.

The files are named as:

SCIA_NO_MLT_orbits_<YYYY>_v<L2_version>.nc

with <YYYY> denoting the year. The retrieval <L2_version> used in this project is 6.2.

No level 2 screening was performed. The files contain the diagonal elements of the averaging kernel matrix and the measurement uncertainties to select the data on a per-use basis.

NO data from SCIAMACHY in the nominal limb mode (daily from September 2002 to April 2012 in the altitude range 60-90 km) are available with a creative commons license at http://www.imk-asf.kit.edu/2939.php, and are described in [3].

2. Stored data

The netCDF files are sorted by measurement year. Each data file contains data from all orbits when SCIAMACHY measured in the MLT mode. The data are provided per orbit on a fixed altitude-latitude grid according to the retrieval setup (2 km x 2.5°).

Provided are the following parameters:

- Equatorial crossing time
- Central altitude of the retrieval bin (± 1 km)
- Latitude (± 1.25°)
- Longitude of the retrieval bin (not limited to [0, 360])
- Envisat orbit number
- NO number density
- Absolute NO number density measurement uncertainty
- Relative NO number density measurement uncertainty
- Averaging kernel diagonal element
- A priori NO number density used in the retrieval
- NO number density as calculated by the NOEM empirical model
- air number density calculated from the NRLMSIS-00 model
- NO volume mixing ratio using NRLMSIS-00 air density
- apparent local solar time (equation of time corrected) at the mean altitude
- mean local solar time at the mean altitude
- mean solar zenith angle at the mean altitude
- UTC (fractional) hour of the day
- Day of retrieved values in UTC
- geomagnetic latitude calculated using the IGRF model
- geomagnetic longitude calculated using the IGRF model

3. Data structure and units

Table 1: Dimensions

Nr	Dimension	Unit	Size
1	time	days since 2000-01-01 00:00:00 (UTC)	unlimited (84 currently)
2	altitude	km	51 (50:150:2)
3	latitude	degrees north	72 (-88.75:88.75:2.5)

Table 2: Variables

Nr	Variable	Unit	Dimension
1	orbit	1	time
2	longitude	degrees east	time x latitude
3	NO_DENS	cm^{-3}	time x latitude x altitude
4	NO_ERR	cm^{-3}	time x latitude x altitude
5	NO_RSTD	%	time x latitude x altitude
6	NO_AKDIAG	1	time x latitude x altitude
7	NO_APRIORI	cm^{-3}	time x latitude x altitude
8	NO_NOEM	cm^{-3}	time x latitude x altitude
9	TOT_DENS	cm^{-3}	time x latitude x altitude
10	NO_VMR	ppb	time x latitude x altitude
11	app_LST	hours	time x latitude
12	mean_LST	hours	time x latitude
13	mean_SZA	degrees	time x latitude
14	UTC	hours	time x latitude
15	utc_day	*cf.* time	time x latitude
16	gm_lats	degrees north	time x latitude
17	gm_lons	degrees east	time x latitude

4. References

[1] Bender, S., Sinnhuber, M.; Burrows, J. P.; Langowski, M.; Funke, B.; Lopez-Puertas, M., Retrieval of nitric oxide in the mesosphere and lower thermosphere from SCIAMACHY limb spectra, *Atmos. Meas. Tech.*, 6, 2521-2531, doi: 10.5194/amt-6-2521-2013, 2013.

[2] Bender, S., Sinnhuber, M.; Clarmann, T. von; Stiller, G.; Funke, B.; López-Puertas, M.; Urban, J.; Pérot, K.; Walker, K. A.; Burrows, J. P., Compariso of nitric oxide measurements in the mesosphere and lower thermosphere from ACE-FTS, MIPAS, SCIAMACHY, and SMR, *Atmos. Meas. Tech.*, 8, 4171-4195, doi: 10.5194/amt-8-4171-2015, 2015

[3] Bender, S., Sinnhuber, M.; Langowski, M.; Burrows, J. P., Retrieval of nitric oxide in teh mesosphere from SCIAMACHY nominal limb spectra, *Atmos. Meas. Tech.*, 10, 209-220, doi: 10.5194/amt-10-209-2017, 2017.