Product Specification Document for OSIRIS MesosphEO L2 data sets

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1. File formatting

The files are in netCDF format and contain profiles on 1 km altitude grids, defined in each file. All data have been pre-screened for outlying data, although require further considerations prior to being used for scientific analysis, as detailed in Section 3. The file format description is provided in Table 1. The location given for each occultation is obtained from the latitude, longitude, solar zenith angle, and time of the 80 km tangent point. A fill value of NaN is used at locations where no value was retrieved.

Table 1: netCDF fields included in MesosphEO OSIRIS data sets.

Parameter	Definition
altitude	Tangent altitude for retrieved values (in km)
scannumber	Typically an eight digit number: OOOOOSSS; SSS represents the scan number within the orbit represented by OOOOO
date	Time (in days) since 1 January 2000, 00:00 UTC.
latitude	Latitude of 80 km geometric tangent point (in degrees N)
longitude	Longitude of 80 km geometric tangent point (in degrees E)
solar zenith angle	Solar zenith angle of 80 km tangent point (in degrees)
target	Retrieved values (in K for temperature, molecules cm^{-3} otherwise)
targetVMR	Retrieved values (O_3 or NO) converted to volume mixing ratio (in ppmv) assuming an NRLMSIS-E-00 background atmosphere
targetvariance	(O_3 only) Square root of the diagonal of the retrieval covariance matrix (in molecules cm^{-3})
targetresponse	(O_3 only) Retrieval response values (unitless)

2. General data usage information

OSIRIS began taking measurements in 2001, however prior to July 2002 the integration time used when observing the mesosphere was adjusted within each scan to improve signal to noise. However, this led to much coarser vertical resolution. From July 2002 to present, the integration

time in the mesosphere has been kept at a consistent 2 s, yielding a vertical resolution on the order of 2 km. The retrieved mesospheric data have not been updated since mid-2012. These data sets only consist of data between 2002 and 2012.

Ozone and nitric oxide concentrations are retrieved as number density values (molecules cm^{-3}), assuming an NRLMSIS-E-00 background atmosphere. In the data sets, the concentrations are also given as volume mixing ratio values, where the MSIS pressure and temperature values were used for the conversion.

3. Species dependent information

Temperature: The data set has been screened for the presence of polar mesospheric clouds in the OSIRIS line-of-sight. Thus, the sampling is much less dense in the polar summer regions. Due to uncertainties in the O_2 concentration, temperature values in the altitude range of ~82-86 km have not been validated and should only be used with extreme caution.

Ozone: It is recommended that only values where the corresponding retrieval response is greater than 0.8 be used for scientific analysis. Since the retrieval is performed in log space, O_3 concentrations may have a positive bias in regions of low O_3 concentrations.

Nitric oxide: Due to large uncertainties in the NO data set, individual profiles should not be used. It is recommended that at least ~100 scans are used when calculating mean values. It is also recommended that negative values not be removed as to avoid biasing mean values.