Sulphur dioxide (SO_2)

readme: version 2.1.0

Each file contains data for one day of observation.
File names include date of observation. Their structure is:

SENSOR_PLATFORM_LEVEL_"SO2"_YYYYMMDD_INSTITUTION_VERSION".nc"

where:
SENSOR = IASI, PLATFORM = METOPA or METOPB, LEVEL = L2, YYYY = year, MM = month, DD = day, INSTITUTION = ULB-LATMOS, VERSION = VX.Y.Z where X.Y is the version number of the retrieval code and Z the version number of the NetCDF file production

The format of the files is NetCDF4.

The structure of the file header (eg for 22 January 2019) is as follows:

```
netcdf IASI_METOPA_L2_SO2_20190122_ULB-LATMOS_V2.1.0 {
dimensions:
        time = 1287172 ;
        nlevels = 7 ;
        nchartime = 16 ;
variables:
        double time(time) ;
                time:long_name = "observation time in seconds since 2007-01-01 00:00:00 UTC" ;
                time:units = "second" ;
                time:standard_name = "time" ;
        char time_string(time, nchartime) ;
                time_string:long_name = "UTC observation time as YYYYMMDDThhmmssZ" ;
        double time_in_day(time) ;
                time_in_day:long_name = "observation time in seconds in the day" ;
                time_in_day:units = "second" ;
        float latitude(time) ;
                latitude:long_name = "latitude of ground pixel center" ;
                latitude:units = "degrees_north" ;
                latitude:valid_range = -90., 90. ;
                latitude:standard_name = "latitude" ;
        float longitude(time) ;
                longitude:long_name = "longitude of ground pixel center" ;
                longitude:units = "degrees_east" ;
                longitude:valid_range = -180., 180. ;
                longitude:standard_name = "longitude" ;
        float sun_zen_angle(time) ;
                sun_zen_angle:long_name = "solar zenith angle at the Earth\'s surface for the pixel center" ;
                sun_zen_angle:units = "degrees" ;
                sun_zen_angle:standard_name = "solar_zenith_angle" ;
        float satellite_zen_angle(time) ;
                satellite_zen_angle:long_name = "Metop zenith angle at the Earth\'s surface for the pixel center" ;
                satellite_zen_angle:units = "degrees" ;
                satellite_zen_angle:standard_name = "platform_zenith_angle" ;
        int orbit_number(time) ;
                orbit_number:long_name = "Metop orbit number" ;
        short scanline_number(time) ;
                scanline_number:long_name = "scanline number in the Metop orbit" ;
        short pixel_number(time) ;
                pixel_number:long_name = "pixel number in the current scanline" ;
                pixel_number:valid_range = 1., 120. ;
        short fov_number(time) ;
                fov_number:long_name = "field of view number in the 2 x 2 observation matrix" ;
                fov_number:valid_range = 1., 4. ;
        short AMPM(time) ;
                AMPM:long_name = "AM/PM flag based on local time" ;
                AMPM:comment = "AM/PM = 0 for AM data, AM/PM = 1 for PM data" ;
        float SO2_all_altitudes(time, nlevels) ;
                SO2_all_altitudes:long_name = "Retrieved SO2 assuming all the SO2 is confined to a small layer centred at 5,
7, 11, 13, 16, 19 or 25 km" ;
```

```
                SO2_all_altitudes:units = "mol m-2" ;
                SO2_all_altitudes:missing_value = -999. ;
                SO2_all_altitudes:multiplication_factor_to_convert_to_molecules_percm2 = 6.02214179e+19 ;
                SO2_all_altitudes:multiplication_factor_to_convert_to_DU = 2238.71442007435 ;
        float SO2_interpolated(time) ;
                SO2_interpolated:long_name = "SO2 interpolated at the retrieved altitude given in SO2_vertical_level
variable" ;
                SO2_interpolated:units = "mol m-2" ;
                SO2_interpolated:missing_value = -999. ;
                SO2_interpolated:multiplication_factor_to_convert_to_molecules_percm2 = 6.02214179e+19 ;
                SO2_interpolated:multiplication_factor_to_convert_to_DU = 2238.71442007435 ;
        float SO2_vertical_level(time) ;
                SO2_vertical_level:long_name = "Retrieved vertical level of the SO2 plume" ;
                SO2_vertical_level:units = "km" ;
                SO2_vertical_level:missing_value = -999. ;

// global attributes:
                :title = "IASI/Metop-A ULB-LATMOS sulfur dioxide (SO2) L2 products (columns and altitudes)" ;
                :institution = "ULB-LATMOS" ;
                :product_version = "2.1.0" ;
                :history = "2019-01-23 06:24:06 - Product generated with retrieval code version 2.1" ;
                :summary = "This dataset contains Level-2 sulfur dioxide columns and plume altitudes products from IASI
observations." ;
                :source = "Eumetsat IASI Level-1C data (version 4 up to 20100518, version 5 from 20100518 to 20110929,
version 6 from 20110929 to 20130808, version 7 from 20130808), Eumetsat IASI Level-2 (version 4 up to 20100914, version 5
from 20100914 to 20140930, version 6 from 20140930, version 6.1 from 20150924, version 6.3 from 20170620)" ;
                :references = "Reference to the SO2 retrieval: Clarisse et al., Retrieval of sulphur dioxide from the infrared
atmospheric sounding interferometer (IASI), Atmos. Meas. Tech., 5, 581-594, doi:10.5194/amt-5-581-2012, 2012. Reference
to the altitude retrieval: Clarisse et al., The 2011 Nabro eruption, a SO2 plume height analysis using IASI measurements,
Atmos. Chem. Phys., 14, 3095-3111, doi:10.5194/acp-14-3095-2014, 2014." ;
                :creator_name = "L. Clarisse (ULB, data PI, lclariss@ulb.ac.be), LATMOS-ULB for data production" ;
                :contact_email = "contact form at http://iasi.aeris-data.fr/contact/" ;
                :data_policy = "Use of these data is free and open access. For substantial use (i.e. the results would have
been different without the IASI dataset), please offer co-authorship and contact the principal investigator (Lieven Clarisse,
lclariss@ulb.ac.be). For minor use (eg a plot), please notify the data owner, send a copy of the manuscript before publication,
cite the proper references to the data as indicated in the references attribute, and acknowledge the AERIS data infrastructure
and the data owner as follows: \"IASI is a joint mission of EUMETSAT and the Centre National d\'Etudes Spatiales (CNES,
France). The authors acknowledge the AERIS data infrastructure for providing access to the IASI data in this study and ULB-
LATMOS for the development of the retrieval algorithms.\"" ;
                :id = "IASI_METOPA_L2_SO2_20190122_ULB-LATMOS_V2.1.0.nc" ;
                :geospatial_lat_min = "-90.0" ;
                :geospatial_lat_max = "+90.0" ;
                :geospatial_latitude_units = "degrees_north" ;
                :geospatial_lon_min = "-180.0" ;
                :geospatial_lon_max = "+180.0" ;
                :geospatial_longitude_units = "degrees_east" ;
                :geospatial_vertical_min = "5" ;
                :geospatial_vertical_max = "25" ;
                :geospatial_vertical_units = "km" ;
                :time_coverage_start = "20190122T000000Z" ;
                :time_coverage_end = "20190122T235959Z" ;
                :netcdf_conventions = "CF-1.6" ;
                :standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Medata Convention version 30, 3
December 2015" ;
                :keywords = "satellite,observation,atmosphere,sulfur dioxide,SO2,level
2,column,altitude,profile,volcano,pollution,IASI,Metop-A" ;
                :keywords_vocabulary = "GCMD Science Keywords" ;
                :platform = "Metop-A" ;
                :sensor = "IASI" ;
                :spatial_resolution = "12km at nadir" ;
}
```