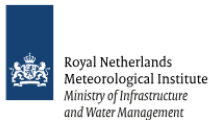




S5P Mission Performance Centre Nitrogen Dioxide [L2__NO2__] Readme



document number	S5P-MPC-KNMI-PRF-NO2	
issue	1.6	
date	2020-11-26	
product version	01.04.00	
status	Released	
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¹ The S5PVT AO project summaries can be found at <https://earth.esa.int/web/guest/pi-community/search-results-and-projects/mission>

CHANGE LOG

Reason for change	Issue	Revision	Date
<ul style="list-style-type: none">Table 2: addition of version 01.04.00Added/updated <code>qa_value</code> filter for variables:<ul style="list-style-type: none"><code>nitrogendioxide_stratospheric_column</code><code>nitrogendioxide_total_column</code><code>nitrogendioxide_summed_total_column</code>Section 5 (Algorithm Change Record) updated with version 01.04.00 information: text related to the improved data quality for anthropogenic emitted NO₂ measurements	1	6	26/11/2020

1 Summary

This is the Product Readme File (PRF) of the Copernicus Sentinel 5 Precursor Tropospheric Monitoring Instrument (S5P/TROPOMI) nitrogen dioxide (NO₂) Level 2 data product and is applicable for the Near Real Time (NRTI) and Offline (OFFL) timeliness products.

Product Identifier: **L2_NO2**

Example filename:

S5P_NRTI_L2_NO2_20181010T221303_20181010T221803_05144_01_010100_20181010T225221.nc

S5P_OFFL_L2_NO2_20181010T225734_20181011T003903_05144_01_010100_20181017T002032.nc

The OFFL data product has the following DOI: <http://doi.org/10.5270/S5P-s4ljg54>

The Readme file describes the current processing baseline, product and quality limitations, and product availability status. More information on this data product is available from the Sentinel product webpage:

<https://sentinels.copernicus.eu/web/sentinel/technical-guides/sentinel-5p/products-algorithms>,

and from the TROPOMI product webpage <http://www.tropomi.eu/data-products>.

The data file contains the `nitrogendioxide_tropospheric_column` which gives the total atmospheric NO₂ column between the surface and the top of the troposphere. The respective error estimate originating from the spectral fit and other retrieval aspects is given in the data field `nitrogendioxide_tropospheric_column_precision`. As a user guideline for the data quality, a `qa_value` is provided with the data. In order to avoid misinterpretation of the data quality, it is recommended at the current stage to only use those pixels with a `qa_value` above 0.75 (or above 0.5 in case cloud covered scenes are also of interest).

Note that the NO₂ data product may be used in different ways, and depending on the application, different data fields in the file are relevant. For details on NO₂ data usage, we refer to the product user manual [RD03]. The averaging kernels are provided in the data product file and should be used, e.g., for comparisons with models or profile measurements. Stratospheric NO₂ columns (`nitrogendioxide_stratospheric_column`) and total as well as summed NO₂ columns (`nitrogendioxide_total_column/nitrogendioxide_summed_total_column`) are provided. For the stratospheric column, it is recommended at the current stage to only use those pixels with a `qa_value` above 0.5. For the total columns the same recommendation as for the tropospheric column applies.

Independent validation by S5p Mission Performance Centre (MPC) Cal/Val experts and the Sentinel-5 Precursor Validation Team (S5PVT) concludes that NRTI / OFFL NO₂ data is compliant with the requirements as defined in the **S5P Calibration and Validation Plan** [RD01], see Table 1.

The quality of the processor version 01.04.00 has been assessed on a small dedicated Test Data Set.

Up to date validation results are available in the Routine Operations Consolidated Validation Reports (ROCVR) that are accessible through the MPC Validation Data Analysis Facility (VDAF) website at <http://mpc-vdaf.tropomi.eu>. The ROCVR reports are issued quarterly and reports released after March 2021 include validation results based on processor version 01.04.xx, while previous ROCVR reports cover validation results for versions 01.02.xx and 01.03.xx.

Parameter	Data product	Vertical Resolution	Bias	Random
NO ₂	Stratospheric NO ₂	Stratospheric column	< 10%	0.5x10 ¹⁵ molec/cm ²
NO ₂	Tropospheric NO ₂	Tropospheric column	25-50%	0.7x10 ¹⁵ molec/cm ²

Table 1: NO₂ data product requirement extracted from the S5p Calibration and Validation Plan [RD01].

2 Processing baseline description

Table 2 contains the history of the NO₂ processor versions. Note that the processor version for NO₂ is changing when there is a change to any of the products belonging to the NL-L2 processor suite (NO₂, CO, CH₄, AI, ALH, O₃ PR) even if the change is not affecting the NO₂ product.

Processor Version	In operation from	In operation until	Relevant improvements
01.04.00	NRTI: orbit 16259, 2020-12-02 OFFL: orbit 16213, 2020-11-29	Current version	The FRESCO-S cloud retrieval was updated (this is an auxiliary input for the NO ₂ processing), resulting in an overall reduction of the cloud pressure, and a substantial increase of NO₂ in the retrievals in polluted regions. Users should be careful when performing trend studies using previous versions and V01.04.xx (see section 5). A full mission reprocessing is foreseen in 2021 to harmonize the dataset.
01.03.02	NRTI: orbit 8906, 2019-07-03 OFFL: orbit 8815, 2019-06-26	Orbit 16256, 2020-12-02 Orbit 16212, 2020-11-29	No changes with respect to previous version
01.03.01	NRTI: orbit 8000, 2019-04-30 OFFL: orbit 7907, 2019-04-23	Orbit 8906, 2019-07-03 Orbit 8814, 2019-06-26	No changes with respect to previous version
01.03.00	NRTI: orbit 07519, 2019-03-27 OFFL: orbit 7425, 2019-03-20	Orbit 7906, 2019-04-23 Orbit 7999, 2019-04-30	<ul style="list-style-type: none"> - The FRESCO-S cloud retrieval has been updated (see section 5) - Definition of <code>qa_value</code> improved (see section 5) - New variables added (see section 6.1)
01.02.02	NRTI: orbit 5931, 2018-12-05 OFFL: orbit 5833, 2018-11-28 RPRO: orbit 2818, 2018-04-30	Orbit 7518, 2019-03-27 Orbit 7424, 2019-03-20 Orbit 5235, 2018-10-17	No changes with respect to previous version
01.02.00	NRTI: orbit 5336, 2018-10-24 OFFL: orbit 5236, 2018-10-17	Orbit 5929, 2018-12-05 Orbit 5832, 2018-11-28	<ul style="list-style-type: none"> - Implementation of a "destriping" algorithm to remove across-track biases between the individual viewing angles (see section 5) - Improvement of the retrieval for high Solar Zenith Angles (SZA) and polar regions (see section 5) - Better algorithm for the computation of the thermal tropopause level resulting in a more realistic distribution of tropopause pressures (see section 5) - New variable added (see section 6.1) - Definition of <code>qa_value</code> improved for good quality retrievals over snow-ice (see section 5)
01.01.00	NRTI: orbit 3947, 2018-07-18 OFFL: orbit 3848, 2018-07-11	Orbit 5333, 2018-10-24 Orbit 5235, 2018-10-17	Update of surface albedo database
01.00.02	NRTI: orbit 3745, 2018-07-04 OFFL: orbit 3661, 2018-06-28	Orbit 3946, 2018-07-18 Orbit 3847, 2018-07-11	Initial operational version

Table 2: History of NO₂ processor versions. In orange, the data versions that are no longer available to the users on the Pre-operations hub.

3 Product Quality

3.1 Recommendations for data usage

The quality of the individual observations depends on many factors, including cloud cover, surface albedo, presence of snow-ice, saturation, geometry etc. These aspects are taken into account in the definition of the "quality assurance value" (`qa_value`), available for each individual observation, which provides the users of the data with an easy filter to remove less accurate observations. The `qa_value` is a continuous variable, ranging from 0 (error) to 1 (all is well). The main flag for data usage is as follows:

For variables `nitrogendioxide_tropospheric_column`,
`nitrogendioxide_total_column`, `nitrogendioxide_summed_total_column`:

- `qa_value > 0.75`

This is the recommended pixel filter. It removes cloud-covered scenes (cloud radiance fraction > 0.5), partially snow/ice covered scenes, errors, and problematic retrievals.

- `qa_value > 0.50`

Compared to the stricter filter, this adds the good quality retrievals over clouds and over scenes covered by snow/ice. Errors and problematic retrievals are still filtered out. In particular, this filter may be useful for assimilation and model comparison studies.

For variable `nitrogendioxide_stratospheric_column`:

- `qa_value > 0.50`

For further details, data users are encouraged to read the Product User Manual (PUM) and Algorithm Theoretical Basis Document (ATBD) associated with this data product, available on <https://sentinels.copernicus.eu/web/sentinel/technical-guides/sentinel-5p/products-algorithms>.

3.2 Validation results

3.2.1 Status of product validation

Independent preliminary validation by S5p MPC Cal/Val experts and the S5PVT concludes that NRT1 / OFFL NO₂ data is in overall agreement with (i) reference measurements collected from global ground-based networks, (ii) the corresponding satellite data products from OMI, and (iii) is compliant with the requirements as defined in S5p Calibration and Validation Plan [RD01], see Table 1.

The upgrade to version 01.04.00 involves a change (see section 5) of the FRESCO-S auxiliary cloud product which results in an expected substantial increase of the tropospheric NO₂ column with respect to the previous version 01.03.02. Exhaustive validation of version 01.04.00 is performed by the S5P MPC Cal/Val team since the operational switch.

Up to date validation results are available in the ROCVR reports that are accessible through the MPC VDAF website at <http://mpc-vdaf.tropomi.eu>. The ROCVR reports are issued quarterly and reports released after March 2021 include validation results based on processor version 01.04.xx, while previous ROCVR reports cover validation results for versions 01.02.xx and 01.03.xx.

4 Data Quality Remarks

4.1 Known Data Quality Issues

Currently, the following data quality issues are known, not covered by the quality flags, and should be kept in mind when using the NO₂ product.

Bands 4 and 6 spatial misalignment

The band 4 (450 pixels per scanline) footprints, used for the NO₂ DOAS retrieval, are not fully aligned with the band 6 footprints, used for cloud and scene pressure retrievals. In the worst case, the misalignment can be in the order of half a ground pixel. The misalignment requires interpolation of the cloud and scene pressure, which may introduce additional uncertainty in those parameters. These parameters are used in the NO₂ air-mass factor calculations. Note that the cloud fraction is determined in the NO₂ fitting window, avoiding the uncertainty by misalignment for this parameter.

Surface albedo climatology

The current surface albedo climatology has a spatial resolution of 0.5°x0.5°, which is coarse compared to the much higher spatial resolution of S5p TROPOMI of 3.5 x 7 km. As a consequence, the albedo grid affects the NO₂ column products quality especially at coastal areas.

Saturation

Some TROPOMI pixels over bright scenes are affected by saturation. Those pixels are flagged and their quality is reflected in the `qa_value`. Nevertheless, in the vicinity of saturated pixels there might be pixels also affected by saturation due to the so-called blooming effect. The `qa_value` also contains a check on the quality of the slant column fit, which effectively removes most of the pixels influenced by blooming. However, some negative impact close to saturated pixels cannot be excluded.

Conservative filtering

The pixel flagging, reflected in the `qa_value`, is defined in a conservative way. When the FRESCO cloud retrieval reports an error, in combination with the misalignment issue, one consequence is the loss of the first row (west side of the orbit), even though good NO₂ slant column retrievals are possible. Another example is the removal of observations when the albedo database shows suspiciously high values.

Metadata values exchanged

The global attributes `geospatial_lon_min` and `geospatial_lon_max` values are exchanged; therefore, the user is advised to switch the values for these fields, making note that the `geospatial_lat_min` and `geospatial_lat_max` values are correct. This is an issue traceable to L1b data (version 01.00.00) and is corrected in the following versions of the Level 1B processor.

Metadata/Attributes

The spatial resolution of the TROPOMI measurements is improved by bringing the along track ground pixel size from 7.0 to 5.5 km starting on 6th August 2019. Note that, after this operations change, the metadata/Attributes fields related to the spatial resolution, remain **unchanged** (hence not aligned to the improved resolution). These fields are planned to be updated with the activation of Level 2 processors version 02.xx.xx in 2021.

4.2 Solved Data Quality Issues

NRTI data gaps northern hemisphere (solved in version 01.01.00)

The NRTI data stream shows data gaps over Kazakhstan, southern part of Russia and Canada due to a miss-configuration of the processing facility. This issue is solved with the activation of processor version 01.01.00 on July 2018 (see Table 2).

Orbit numbering in NRTI and OFFL (solved in version 01.02.02)

Note that NRTI orbit numbers are set with respect to the downlink orbit while OFFL orbit numbers are set with respect to the equator crossing time. This creates an inconsistency between the NRTI and OFFL orbit numbers. This problem was solved with the activation of processor version 01.02.02 (see Table 2), after which the orbit numbers are consistent.

4.3 Data Features

This section describes some characteristics of the data that might seem anomalous, however they are physically correct and not related to any problem.

Pixel geolocation around North Pole (feature)

The solar irradiance is measured on a daily basis over the North Pole at a reference azimuth angle to remove seasonal effects on the measurements. To this end, a yaw manoeuvre is executed when the instrument is still in radiance mode, causing possible distortion on the scanlines observed during this manoeuvre (i.e. crossing scanlines, "bow-tie" ground pixel shape instead of rectangular). This occurs at most during the last 26 seconds of radiance measurements in few orbits (7-9 per week). Though this may seem anomalous, it is physically correct, and not related to any problem on the data geolocation.

4.4 Mission Operations Changes

A change in the Copernicus Sentinel 5P operations scenario, increasing the spatial resolution from 7.0 km to 5.5 km along track for all measurements, became operational starting from 6 August 2019, orbit 9388.

5 Algorithm Change Record

For a detailed description of the L2__NO2__ algorithms, please refer to the ATBD [RD02].

Important note for users: The upgrade to version 01.04.00 (see Table 2) leads to a substantial increase of the tropospheric NO₂ columns, notably over polluted areas for scenes with small cloud fractions. Time series including data before and after the activation of this version will therefore show an artificial positive jump related to the upgrade.

Version 01.04.00

The main changes in the upgrade from version 01.03.02 to 01.04.00 are:

- The FRESCO-S cloud retrieval scheme is updated to span a wider range of wavelengths in the O2-A band, including the weaker absorption features (FRESCO-wide). As a result, the cloud pressures show an overall decrease, especially for low clouds. For high clouds the changes are relatively minor. Figure 1 shows the change in cloud pressure for pixels with a `qa_value` > 0.75, which are pixels with a cloud radiance fraction < 0.5, pixels which are mostly cloud-free. More detailed inspection shows that the updated FRESCO provides more realistic pressures, for instance in the case of heavy aerosol loads or in the case of low clouds over sea/ocean. In the latter case the previous FRESCO version often shows pressures equal to the sea surface pressure, but the FRESCO update produces more realistic elevated cloud heights. As a result of the higher clouds, the air-mass factor is reduced between 0 and 50%, depending on the location and cloud fraction (for a cloud fraction equal to zero there is no difference), see Figure 2, left. As a consequence, the tropospheric NO₂ column is increased between 0 and about 50%, see Figure 2, right. Similar results are found over other continents.
- Because of the overall decrease in cloud pressure, the criterion to decide if pixels above snow and ice are cloudy or cloud free was also adjusted. This criterion is based on the difference between surface and cloud pressure as described in the ATBD [RD02].

Fresco minus Fresco-wide cloud pressure difference, 2019-05-10

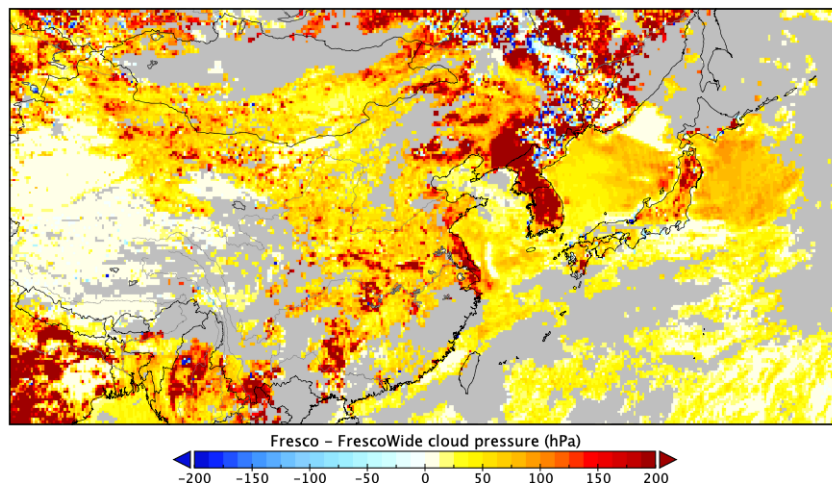


Figure 1: The cloud pressure difference (V01.03.02 using previous FRESCO minus V01.04.00 using the new FRESCOwide) for 10 May 2019 over East Asia (unit: hPa). Note that the data has been filtered for values `qa_value` > 0.75, which implies nearly cloud free pixels. For the cloud pressure retrieval this is the most difficult subset of pixels (but also the relevant subset for NO₂ retrievals). Over land, the retrieved pressures for these nearly cloud free pixels may differ by more than 200 hPa for small cloud fractions. The new FRESCO V01.04.00 shows lower cloud pressures in most cases (yellow-red colors). Over sea and ocean the differences are smaller, up to 50 hPa. For cloud-covered pixels (not shown) the differences are smaller.

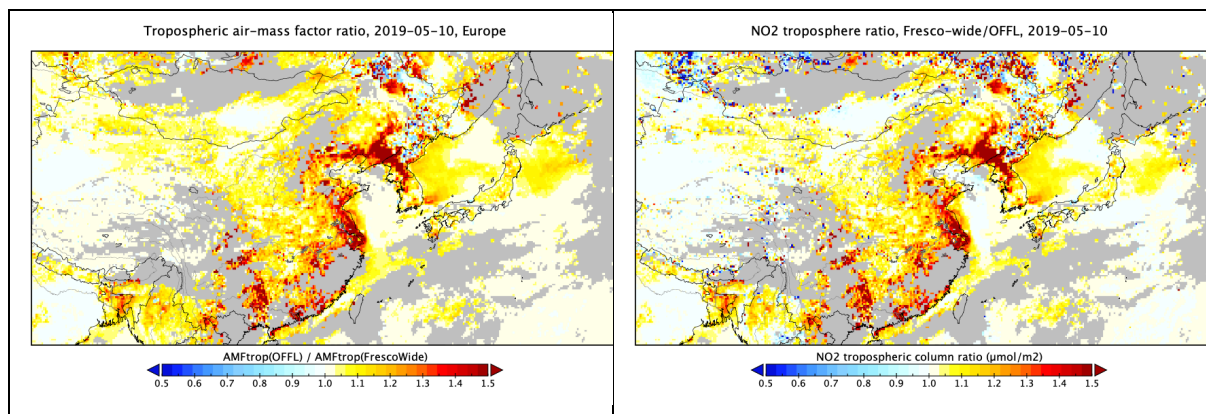


Figure 2: Left: the air-mass factor ratio (V01.03.02/V01.04.00). Right: the NO₂ tropospheric column ratio (V01.04.00/ V01.03.02). White and yellow colours indicate small changes < 15% for most of the domain, but a substantial fraction of observations, including polluted regions, shows columns enhanced by up to 50% (red).

Version 01.03.00

The main changes in the upgrade from version 01.02.00 to 01.03.00 are:

- The FRESCO-S cloud retrieval has been updated. The surface albedo is now adjusted to match the top of atmosphere reflectance if the top of atmosphere reflectance is lower than expected using the prescribed surface albedo and cloud fraction 0. In this way negative cloud fractions are avoided. Similar changes were implemented for fully cloud covered scenes. See Figure 3.
- The rules determining the `qa_value` have been adjusted. In particular the lower limit on the tropospheric air-mass factor was reduced, which increases the number of valid pixels somewhat.
- Two output fields were added, the “`air_mass_factor_clear`” and “`air_mass_factor_cloudy`” (see section 6.1.2), which are the tropospheric air-mass factors for cloud fraction 0 and 1, respectively.
- The wind speed at 10m altitude was added for interpretation of the observations (direction of the pollution plumes).

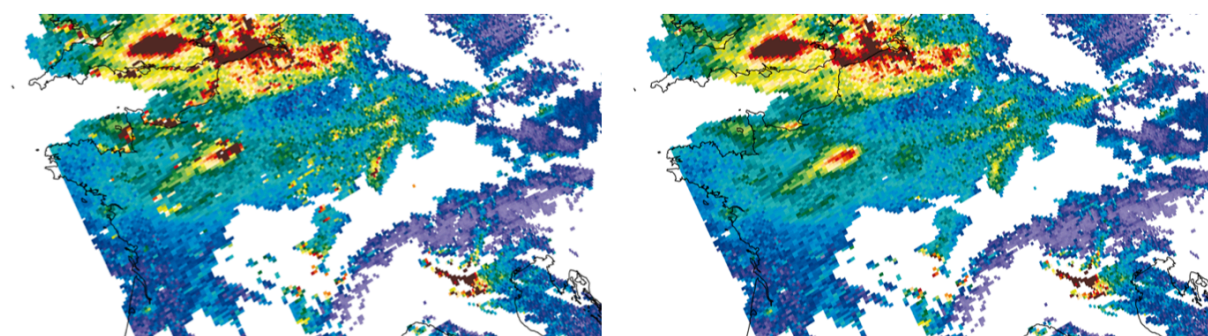


Figure 3: The retrieval of tropospheric NO₂ over France on 24 February 2018, for version 01.02.00 (left) and version 01.03.00 (right). Data has been filtered for clouds (white area). In the (relatively rare) case that the cloud fraction from the NO₂ spectral window is positive, but FRESCO-S (v01.00-01.02) retrieves a negative cloud fraction with unrealistic cloud pressures, this was resulting in high, noisy NO₂ spots around Paris (left panel, v01.00-01.02). With the new treatment in FRESCO-S, resulting in more realistic cloud pressures, these spots disappear and we observe a well-defined pollution plume from Paris transported by the wind from the north-east (right panel, v01.03).

Version 01.02.00

The main changes in the upgrade from version 01.01.00 to 01.02.00 can be summarized as follows:

- A "destriping" algorithm is used to remove across-track biases between the individual viewing angles. A stripe amplitude is computed on a daily basis over the (clean) tropical Pacific Ocean, averaged over a 30-degree latitude region and over a period of 7 days. The array of stripe amplitudes is provided in the L2 files and also in the product support file (see Figure 4).
- The retrieval for the high Solar Zenith Angles (SZA) and polar regions has improved through several changes. In the TM5-MP model, the photolysis for $SZA > 85^\circ$ was improved, impacting in particular the stratospheric NO_2 columns at high latitudes. The assimilation of NO_2 observations is now restricted to the ascending part of the orbit (see Figure 5).
- Good quality retrievals over snow-ice now receive a `qa_value` > 0.75 when the scene pressure from the FRESKO-S cloud retrieval is close to the surface pressure. The cloud retrieval cannot distinguish clouds from snow/ice, but the near equivalence of the scene pressure and surface pressure indicates that the scene is (nearly) cloud-free. Together with the high SZA improvements, the number of reliable retrievals over high latitude regions has increased substantially.
- The computation of the thermal tropopause level now uses a more advanced algorithm, resulting in a more realistic distribution of tropopause pressures.

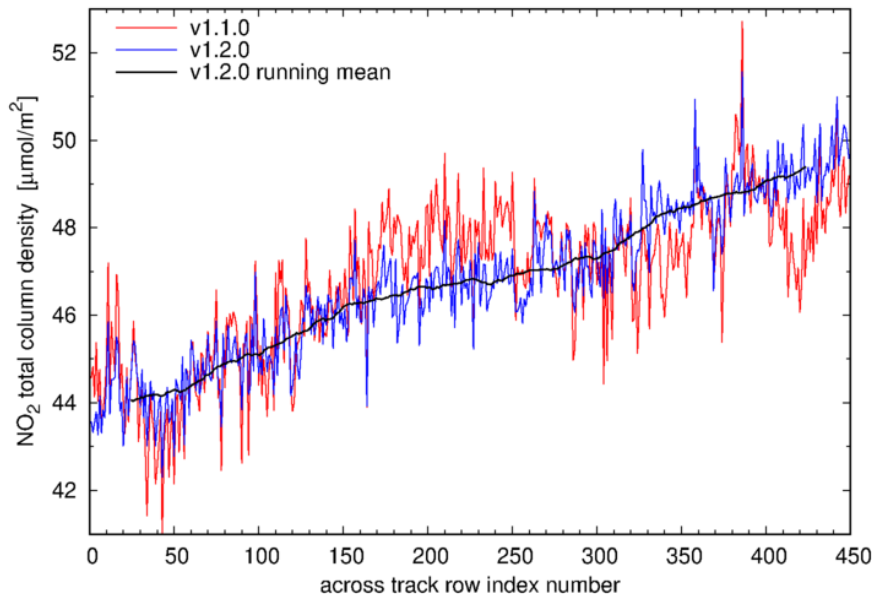


Figure 4: A comparison of the mean total column (stratosphere plus troposphere) averaged over the tropical Pacific on 15 July 2018 as a function of the viewing angle, or row index. The red curve is the v1.1.0 results without destriping, and the blue curve is the v1.2.0 result with the destriping (the stripe correction is averaged over a week). In black we show a 50-row running mean of the blue curve. The red curve shows single-row spikes, as well as correlated structures, such as the high values around row 200 and the low values around 40, 320 or 420. These correlated features are currently under investigation together with the L1 team. The plot shows that the stripe filtering removes the major part of both the high and low frequency variability. Note that the amplitude of the structures in the red curve is small, generally within 5% of the column over the clean Pacific Ocean. Also note that we expect an increase of the total column in the stratosphere from left to right, as indicated by the black curve, due to the diurnal cycle of stratospheric NO_x chemistry.

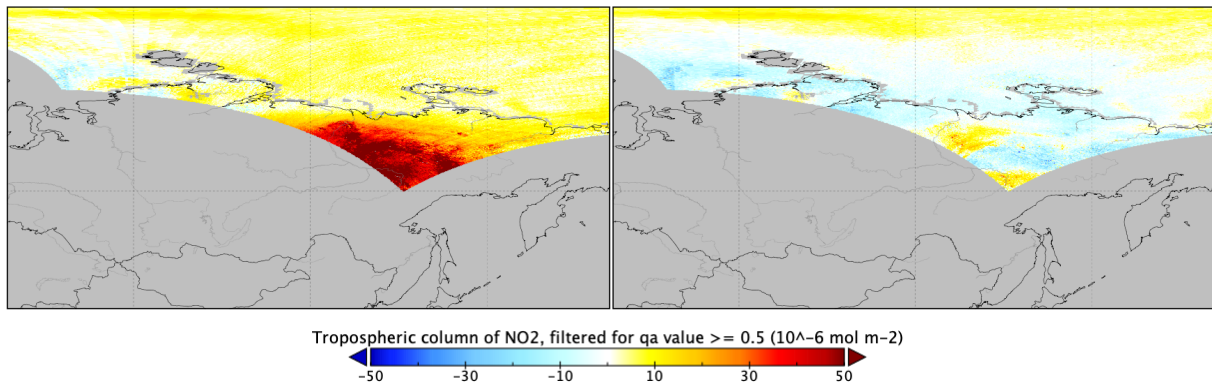


Figure 5: The NO₂ tropospheric column retrievals for the descending part of orbit 3623, 25 June 2018, 19 UTC, over Siberia. Version 1.0.2 is shown on the left and version 1.2.0 on the right. Prominent unrealistic positive biases are observed in v1.0.2 (as it also occurs in v1.1.0) for the highest solar zenith angles on the left side of the orbit, while v1.2.0 has much more realistic values close to zero with a tendency towards a weak negative bias.

6 Data Format

The product is stored as NetCDF4 file. The NetCDF4 file contains both the data and the metadata for the product.

For OFFL data the product is stored as a single file per satellite orbit, for NRTI data the product is stored as multiple files (5 minute granules) per orbit.

Please note that consecutive data granules of the NRTI product show an overlap of about 12 scan lines. Details of the data format are provided in the Product User Manual (PUM) [RD03].

6.1 Data format changes

6.1.1 Version 01.04.00

There are no format changes with respect to the previous version.

6.1.2 Version 01.03.00

New variables

```
/PRODUCT_SUPPORT_DATA/DETAILED_RESULTS/air_mass_factor_clear  
/PRODUCT_SUPPORT_DATA/DETAILED_RESULTS/air_mass_factor_cloudy  
/PRODUCT/SUPPORT_DATA/INPUT_DATA/eastward_wind  
/PRODUCT/SUPPORT_DATA/INPUT_DATA/northward_wind
```

6.1.3 Version 01.02.00

New variables

```
/PRODUCT_SUPPORT_DATA/DETAILED_RESULTS/nitrogendioxide_slant_column_density  
_stripe_amplitude (added also to the auxiliary input CTMFCT files)
```

7 Product Availability

The data are available from the Copernicus Open Data Hub <https://scihub.copernicus.eu>.

More information on this data product and data handling tools are available from the product web page under heading 'Tools': <http://www.tropomi.eu/data-products>.

For further questions regarding S5P/TROPOMI data products please contact EOSupport@Copernicus.esa.int.

The access and use of any Copernicus Sentinel data available through the Sentinel Data Hub is governed by the Legal Notice on the use of Copernicus Sentinel Data and Service Information and is given here:

https://sentinels.copernicus.eu/documents/247904/690755/Sentinel_Data_Legal_Notice.

8 References

- [RD01] Sentinel-5 Precursor Calibration and Validation Plan for the Operational Phase
source: ESA; **ref:** ESA-EOPG-CSCOP-PL-0073;
url: <https://sentinel.esa.int/documents/247904/2474724/Sentinel-5P-Calibration-and-Validation-Plan.pdf>
- [RD02] Sentinel-5 precursor/TROPOMI Level 2 Algorithm Theoretical Basis Document Total and Tropospheric NO₂ Data Products,
source: KNMI; **ref:** S5P-KNMI-L2-0005-RP;
url: <https://sentinel.esa.int/documents/247904/2476257/Sentinel-5P-TROPOMI-ATBD-NO2-data-products>
- [RD03] Sentinel-5 precursor/TROPOMI Level 2 Product User Manual Nitrogen Dioxide
source: KNMI; **ref:** S5P-KNMI-L2-0021-MA;
url: <https://sentinel.esa.int/documents/247904/2474726/Sentinel-5P-Level-2-Product-User-Manual-Nitrogen-Dioxide>
- [RD04] Validation Reports of the Sentinel-5 Precursor Operational Data Products
Source: BIRA; **ref:** S5P-MPC-IASB-ROCVR;
url: <http://mpc-vdaf.tropomi.eu/>

More information on this data product is available from the Copernicus Sentinel product webpage:
<https://sentinels.copernicus.eu/web/sentinel/technical-guides/sentinel-5p/products-algorithms>,
and from the corresponding TROPOMI product webpage <http://www.tropomi.eu/data-products>.

Abbreviations and acronyms

ATBD	Algorithm Theoretical Basis Document
BIRA-IASB	Royal Belgian Institute for Space Aeronomy
DLR	German Aerospace Center / Deutsches Zentrum für Luft- und Raumfahrt
DOAS	Differential Optical Absorption Spectroscopy
DOI	Digital Object Identifier
ESA	European Space Agency
ESL	Expert Support Laboratory
ESRIN	European Space Research Institute of ESA
FRESCO	Fast REtrieval Scheme for Clouds from the Oxygen A band
KNMI	Koninklijk Nederlands Meteorologisch Instituut – Royal Dutch Meteorological Institute
MAX-DOAS	Multi Axis Differential Optical Absorption Spectroscopy
MPC	Mission Performance Centre
NASA	National Aeronautics and Space Administration
NRT	Near-Real Time
NRTI	Near-Real Time (data product)
NDACC	Network for the Detection of Atmospheric Composition Change
OFFL	Off-line (non-time-critical data product)
OMI	Ozone Monitoring Instrument
PANDORA	Not an acronym; direct Sun UV-visible spectrometer
PDGS	Payload Data Ground Segment for Sentinel-5P
PRF	Product Readme File
PUM	Product User Manual
QA4ECV	Quality Assurance for Essential Climate Variables, EU FP7 project, http://www.qa4ecv.eu
QDOAS	Cross-platform application for DOAS retrievals, developed by BIRA-IASB
QWG	Quality Working Group
RPRO	Retrieval reprocessing product
SNR	Signal-to-Noise Ratio
S5P	Sentinel-5 Precursor
S5PVT	Sentinel-5 Precursor Validation Team
TROPOMI	TROPOspheric Monitoring Instrument
VCD	Vertical Column Density
VDAF	Validation Data Analysis Facility