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# Sentinel 5 precursor Mission Performance Center Level 2 Quality Control Component

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The Copernicus Sentinel 5 Precursor (S5P) is the first of the European Sentinels satellites dedicated to monitoring of the atmospheric composition. S5P was launched on October 13, 2017. The mission objectives of S5P are to monitor air quality, climate and the ozone layer, in the time period between 2017 and 2023. S5P flies in a Sun-synchronized polar orbit with a 13:30 hr local equator crossing time.

The single payload of the S5P mission is TROPOspheric Monitoring Instrument (TROPOMI), which is developed by The Netherlands in cooperation with the European Space Agency (ESA). TROPOMI is a nadir viewing shortwave spectrometer that measures in the UV-visible wavelength range (270 – 500 nm), the near infrared (675 – 770 nm) and the shortwave infrared (2305 – 2385 nm). With a spatial resolution of $7 \times 3.5\,\mathrm{km}^2$ at nadir and about 20 million measurements per day, TROPOMI will be a major step forward compared to its predecessors OMI (Ozone Monitoring Instrument) and SCIAMACHY (Scanning Imaging Absorption Spectrometer for Atmospheric Chartography). The spatial resolution is combined with a wide swath to allow for daily global coverage. The TROPOMI/S5P geophysical (Level 2) operational data products include nitrogen dioxide, carbon monoxide, ozone (total column, tropospheric column profile), methane, sulfur dioxide, formaldehyde and aerosol and cloud parameters.

Part of the S5P ground segment is the Mission Performance Center (MPC), which aides in monitoring the performance of the TROPOMI instrument, and act quickly in case anomalies are observed. This is done for the in flight calibration measurements and level 1B, including measurement types and reporting via http://mps1.tropomi.eu, for level 2 quality control via http://mpc-l2.tropomi.eu and for routine validation via http://mpc-vdaf.tropomi.eu/. In this contribution we focus on the level 2 Quality Control component. The level 2 data volume is large, about 42 GB per day for all level 2 products combined. With some 20 million spectra per day, it is clear that some form of data reduction is needed to be able to monitor the level 2 output of Sentinel 5 precursor. This data reduction is performed by PyCAMA, already within the payload data ground segment at DLR, where the L0-L1B and L1B-L2 processing is done. The data extractions are then transferred to KNMI where the visualization is done and the website is served to the level 2 team.

PyCAMA is a configurable tool written in Python, that generates level 3 gridded data, extracts histograms and other statistics from level 2 data, and generates 2D histograms from all combinations of parameters to spot hidden relations in the dataset. It is possible to perform simple arithmetic on the input variables, for instance to calculate the difference between versions of the same algorithm. The PyCAMA tool also offers facilities to visualise the extracted data. The PyCAMA tool is available as open source via http://tropomi.eu/tools, and is intended to be used on HDF-5 based level 2 products, provided some minimal metadata is present. If you are compliant with the Climate and Forecast metadata conventions for NetCDF4, or use HDF-EOS 5, then the tool will be useful to you.