New and improved data from the Pandonia Global Network for satellite validation

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The worldwide operating Pandonia Global Network (PGN) is measuring atmospheric trace gases at high temporal resolution with the purpose of air quality monitoring and satellite validation. It is an activity carried out jointly by NASA and ESA as part of their “Joint Program Planning Group Subgroup” on calibration and validation and field activities, with additional collaboration from other institutions, most notably a strongly growing participation of the US Environmental Protection Agency (EPA). The more than 50 official PGN instruments are homogeneously calibrated and their data are centrally processed in real-time. Since 2019, total NO2 column amounts from the PGN are uploaded daily to the ESA Atmospheric Validation Data Centre (EVDC), where they are used for operational validation of Sentinel 5P (S5P) retrievals. During 2020, a new processor version 1.8 has been developed, which produces improved total NO2 column amounts and also the following new PGN products: total columns of O3, SO2 and HCHO based on direct sun observations and tropospheric columns, surface concentrations and tropospheric profiles of NO2 and HCHO based on sky observations. In this presentation we show some first examples of comparisons of the new PGN products with S5P data. Compared to the total NO2 columns from the previous processor version 1.7, the 1.8 data use better estimations for the effective NO2 temperature and the air mass factor. The effect of this improvement on the comparison with S5P retrievals is shown for some remote and high-altitude PGN sites. The new PGN total O3 column algorithm also retrieves the effective O3 temperature, which is a rather unique feature for ground-based direct sun retrievals. This allows us to analyze whether potential differences to satellite O3 columns might be influenced by the O3 temperature. Including the O3 temperature in the spectral fitting has also allowed the retrieval of accurate total SO2 columns. This PGN data product is of
particular interest for satellite validation, as ground-based total SO2 column amounts are hardly measured by other instrumentation. An initial comparison of the PGN SO2 columns with S5P retrievals at selected PGN sites around the world is shown. PGN total HCHO columns from direct sun measurements are now possible for those PGN instruments, where the hardware parts made of Delrin, which outgasses HCHO, have been replaced by Nylon pieces. An initial comparison to HCHO retrievals from S5P is shown for locations with these upgraded instruments. Another new feature in the 1.8 PGN data is that they come with comprehensive uncertainty estimations, separated in the output files as independent, structured, common and total uncertainty.