Validation of the S5P Formaldehyde L2 product using MAX-DOAS network observations

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The Sentinel-5 Precursor (S5P) was launched on the 13th of October 2017, with on board the TROPOspheric Monitoring Instrument (TROPOMI). The formaldehyde (HCHO) L2 product is operational since the end of 2018. The prototype of the tropospheric HCHO retrieval algorithm is developed at BIRA-IASB and implemented at the German Aerospace Center (DLR) in the S5P operational processor (De Smedt et al., 2018).

In this work, we investigate the quality of the HCHO tropospheric column product and its validation within the MPC framework (Mission Performance Center) and the S5PVT NIDFORVAL project (SSP Nitrogen Dioxide and FORmaldehyde VALidation). Within NIDFORVAL, the S5P HCHO product has been validated using the full FTIR and MAXDOAS dataset. Validation results have been assessed against reported product uncertainties taking into account the full comparison error budget, showing that the product quality reaches its requirements.

Here, we focus on satellite-satellite comparison based on the OMI QA4ECV HCHO product and on ground-based validation using MAX-DOAS and Pandora network observations. About 15 HCHO measuring stations are involved, providing data corresponding to a wide range of observation conditions at mid and low latitudes, and covering remote, sub-urban, and urban polluted sites. Comparison results show usually negative biases for large HCHO columns, while a positive offset is observed for the lowest columns. For the MAX-DOAS stations providing vertical profile retrievals, the impact of a priori profiles on the comparison is assessed. The dataset allows to discuss validation results as a function of emission source. Seasonal and diurnal variations are compared. Long term variation are also monitored using the OMI and MAX-DOAS QA4ECV dataset.