



## **Validation of TROPOMI/S5P tropospheric NO<sub>2</sub> column measurements using multi-azimuthal MAX-DOAS observations in Uccle, Belgium**

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Ground-based measurements of tropospheric NO<sub>2</sub> column and profiles have been performed for several months in 2018 using the BIRA-IASB NDACC-certified dual-axis MAX-DOAS spectrometer. The system was operated in dual-scan configuration, where both elevation scans (in one fixed azimuth) and azimuth scans (in one fixed elevation) were successively performed at a frequency of one full cycle of measurements per half hour. Using algorithms developed as part of the ESA FRM4DOAS project and in the context of the PhD thesis of E. Dimitropoulou, the tropospheric NO<sub>2</sub> columns and corresponding surface concentrations were retrieved in 15 azimuthal directions allowing to sample the NO<sub>2</sub> column distribution over a wide area around the observation site. Using elevation scans, also the vertical profile of the NO<sub>2</sub> concentration was retrieved twice per hour. These measurements were exploited to validate TROPOMI NO<sub>2</sub> column measurements in the Brussels area. We show that the use of multiple-azimuth observations allow to reduce considerable the comparison noise with satellite data, owing to an improved spatial collocation with satellite ground-pixels. Results also show that the operational TROPOMI NO<sub>2</sub> product tends to systematically underestimate MAX-DOAS measurements in the Brussels urban area. Further using MAX-DOAS profile information, we show that this underestimation is mostly due to inadequate a-priori NO<sub>2</sub> profile information used in the operational TROPOMI NO<sub>2</sub> algorithm.