Motivation

- Ground-based MAX-DOAS spectra can be used for the retrieval of tropospheric NO₂ vertical column densities and, thus, are important data for satellite validation.
- Within the VINDOBONA project, three new 2 MAX-DOAS instruments have been installed at three different locations in Vienna.
- Recent validation studies have found a systematic underestimation of satellite measurements of tropospheric NO₂. Two possible reasons were highlighted: (1) Satellite observations do not fully resolve the horizontal gradients and (2) profile heights of NO₂ and aerosols in satellite retrievals are not accurate enough.
- In this study, (1) is evaluated by including and converting NO₂ surface concentrations from air quality monitoring stations. Moreover, ancillary measurements that could be used to correct (2) are presented.

Tropomi vs. MAX-DOAS NO₂ VCDs

- A comparison of Tropomi and MAX-DOAS VCDs shows that MAX-DOAS VCDs are higher than Tropomi VCDs.

Contribution of aerosols to NO₂ VCDs

- A comparison of DOAS measurements and Tropomi VCDs shows that the contribution of aerosols to NO₂ VCDs is significant.

Conversion of concentrations into VCDs

- To investigate the effect of horizontal gradients, NO₂ concentrations from air quality monitoring stations falling within Tropomi pixels are converted into tropospheric NO₂ VCDs and then included for the retrieval.

Spatiotemporal variability of NO₂ and aerosols

- The inclusion of converted NO₂ surface concentrations from air quality monitoring stations does not change the slope of the linear regression line.

Summary & Outlook

- Tropospheric NO₂ VCDs from three MAX-DOAS instruments in Vienna, Austria, are used for satellite validation.
- As highlighted in recent validations studies, a systematic underestimate of satellite observations is found.
- The inclusion of converted surface NO₂ concentrations from 21 air quality monitoring stations for comparison with satellite data does not really change the result.
- Other factors than horizontal gradients, e.g. aerosol and NO₂ layer height used for the computation of airmass factors might have a larger effect.
- Future efforts are directed towards development of correction factors for AMFs by using ancillary data.

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