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Stratospheric NO_2 vertical profile retrieved from ground-based Zenith-Sky DOAS observations at Kiruna, Sweden

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Stratospheric NO_2 destroys ozone and acts as a buffer against halogen-catalyzed ozone loss through the formation of reservoir species ($ClONO_2$, $BrONO_2$). Since the importance of both mechanisms depends on the altitude, the investigation of stratospheric NO_2 vertical distribution can provide more insight into the role of nitrogen compounds in the destruction of ozone.
Here we present stratospheric NO_2 vertical profiles retrieved from twilight ground-based zenith-sky DOAS observations at Kiruna, Sweden (68.84°N, 20.41°E) covering 1997 – 2013 periods. This instrument observes zenith scattered sunlight. The sensitivity for stratospheric trace gases is highest during twilight due to the maximum altitude of the scattering profile and the light path through the stratosphere, which vary with the solar zenith angle.
The profiling algorithm, based on the Optimal Estimation Method, has been developed by IASB-BIRA and successfully applied at other stations (Hendrick et al., 2004). The basic principle behind this profiling approach is that during twilight, the mean Rayleigh scattering altitude scans the stratosphere rapidly, providing height-resolved information on the absorption by stratospheric NO_2. In this study, the long-term evolution of the stratospheric NO_2 profile at polar latitude will be investigated.

Hendrick, F., B. Barret, M. Van Roozendael, H. Boesch, A. Butz, M. De Mazière, F. Goutail, C. Hermans, J.-C. Lambert, K. Pfeilsticker, and J.-P. Pommereau, Retrieval of nitrogen dioxide stratospheric profiles from ground-based zenith-sky UV-visible observations: Validation of the technique through correlative comparisons, Atmospheric Chemistry and Physics, 4, 2091-2106, 2004