

## RETRIEVAL OF TROPOSPHERIC NO<sub>2</sub> BY SYNERGISTIC USE OF SCIENTIFIC SCIAMACHY DATA AND GROUND-BASED FTIR MEASUREMENTS AT THE ZUGSPITZE

### Abstract text

Ground-based FTIR is a highly accurate measure for the pure stratospheric column of NO<sub>2</sub>, and can thus be used synergistically with satellite NADIR DOAS soundings to complement the reference sector method for global tropospheric NO<sub>2</sub> retrievals. Columnar NO<sub>2</sub> from FTIR measurements at the Zugspitze (47.42 °N, 10.98 °E, 2964 m asl.) were used synergistically with SCIAMACHY satellite data (Univ. Bremen algorithm UB1.5). A new concept to match FTIR data to the time of satellite overpass makes use of the NO<sub>2</sub> daytime increasing rate retrieved from the FTIR data set itself [ $+1.02(6)E+14$  cm<sup>-2</sup>/h]. SCIAMACHY data within a 200-km selection radius around Zugspitze were considered, and a pollution-clearing scheme was developed to select only pixels corresponding to clean background (free) tropospheric conditions. Analysis of the averaging kernels gives proof that a high-mountain-site FTIR is a highly accurate measure for the stratospheric column, while SCIAMACHY shows significant tropospheric sensitivity. Based on this, we set up a combined FTIR-SCIAMACHY retrieval for NO<sub>2</sub> which delivers two independent pieces of information for troposphere and stratosphere, respectively. It yields an annual cycle of the background (free) tropospheric column between  $0.75$ - $1.54E+15$  cm<sup>-2</sup>, and an intermediate phase between that known for boundary layer and stratosphere, respectively.