



## **MAX-DOAS measurements of nitrogen dioxide at the high altitude sites Zugspitze (2964 m) and Pico Espejo (4765 m)**

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Spectral measurements at two mountain sites were performed with a MAX-DOAS (Multi AXis Differential Optical Absorption Spectroscopy) instrument from February to July 2003 (Zugspitze, Germany) and from March 2004 to November 2008 (Pico Espejo, Venezuela).

Here, these measurements are used for the retrieval of slant column densities (SCDs) of nitrogen dioxide ( $NO_2$ ). While at the altitude of observations the  $NO_2$  levels are usually small, uplifting of anthropogenic emissions from the valley and in Venezuela also transport of emissions from biomass burning can lead to significant enhancements. Daily, weekly, and seasonal cycles of  $NO_2$  SCDs are shown for the two stations, linked to different meteorological conditions and compared between the two sites.

In a next step, a preliminary approach to derive vertical column densities (VCDs) is presented. VCDs of  $NO_2$  from ground-based MAX-DOAS instruments provide useful information for the validation of satellite instruments such as SCIAMACHY, OMI, and GOME-2. Comparisons between ground-based and satellite-based  $NO_2$  VCDs are shown for selected periods.