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Investigation of the spatial and temporal variation of tropospheric ozone using SCIAMACHY limb-nadir matching observations

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Tropopsheric ozone concentration varies both spatially and temporarily. It varies from non-detectable near the sources of production to several hundreds parts per billion (ppb) of air in areas downwind of the source of production. It also varies temporally in phase with human activity patterns, increasing during the day when formation rates exceed destruction rates, and decreases at night when formation processes are inactive. This diurnal variation in ozone depends on location, with the peaks being very high for relatively brief periods of time in urban areas, and being low with relatively little diurnal variation in remote regions. It also varies seasonally, being highest during summer and early spring months and lower during winter months. Tropospheric ozone concentration also varies annually due to some metrological conditions such as El Nino, La Nina and other variations in global pressure systems that promote more or less dispersion of emission than normal. In this presentation, we investigate the spatial and temporal variation of tropospheric ozone using the Scanning Imaging Absorption spectroMeter for Atmospheric CartograpHY (SCIAMACHY) limb-nadir observation techniques. This technique involves the retrieval of stratospheric ozone column from the UV-B spectral range of the limb scattering measurements of SCIAMACHY, and the total ozone column also from the same instrument in the nadir viewing geometry. The stratospheric column was derived by integrating the stratospheric ozone concentration upward from the tropopause height. The tropopause height was determined using the daily temperatures of standard analyses from the European Centre for Medium-Range Weather Forecasts (ECMWF) in 1.5^ox 1.5^o x 91 levels, by an algorithm which was based on both the thermal definition of tropopause using the WMO lapse-rate criterion as well as the potential vorticity definitions of the tropopause. The total column was retrieved using the Weighting Function DOAS algorithm (WFDOAS) at the spectral window of 326.6 nm - 334.5 nm. The tropopspheric ozone column was then derived by subtracting the stratospheric ozone column from the total ozone column. This talk will be aimed at presenting some innovating results on the spatial and temporal variation of tropospheric ozone column as well as the sensitivity studies and some validations that were carried out.