



Application of DOAS measurements in Stara Zagora station (42N, 26E) for investigation of tropospheric NO₂ pollution

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The increase of the NO₂ pollution as a result of the anthropogenic activity needs its ground-based and satellite monitoring. Since August 1999 at the Stara Zagora Division of STIL – BAS, by means of the GASCOD instrument, regular observations have been carried out of NO₂ and O₃ by applying the method of the Differential Optical Absorption Spectrometry (DOAS). Regular morning and evening measurements in 410 - 470 nm spectral range, where NO₂ exhibits strong absorption lines, are conducted. The obtained NO₂ slant column density includes the stratospheric and tropospheric amounts. The data series cover the time period from August 1999 to the end of 2005.

The main sources of tropospheric NO₂ are biomass burning, industrial emissions (for example, by power plants), fuel combustion, soil emissions and lightening. The lifetime of NO_x in the boundary layer is of the order of hours to one day, and in the upper troposphere it increases up to few days. Polluted air masses are transported from their source in the direction, determined by winds in the corresponding altitudes. Thus, the duration of the pollution events is approximately some days, including also stratospheric exchange processes. The stratospheric NO₂ distribution is more homogeneous than that of tropospheric NO₂ and the local stratospheric NO₂ amounts vary in longer time scale than in the troposphere. With the presumption that the short-time variations are mainly caused by tropospheric pollution events, and that they are superimposed on the stratospheric NO₂ amounts, the tropospheric NO₂ pollution can be obtained by the differences between the values of the NO₂ vertical column density (VCD) time series and the running minimum filter ones. The moving minimum filter describes a lower

evolvent of the NO₂ time series. The analysis of the tropospheric NO₂ air pollution time series shows seasonal variations having maximum in autumn and minimum in spring. The reasons of the observed seasonal variations are not explained yet, however, the regional synoptic processes probably should be taken into account.