Ozone minihole observation over the Balkan Peninsula in March 2005

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Areas with dimensions of 1000 km – 3000 km in which the total ozone content (TOC) decreases fast are called ozone miniholes. They are generated mainly dynamically in two ways, either by poor ozone airmass transport from the tropics to higher latitudes by planetary wave activity or, they are connected with strong adiabatic uplifting of the tropopause height. An ozone minihole, generated by the second mechanism was observed over the Balkan Peninsula on 19/21 March 2005. In the middle of March, the polar vortex was strongly disturbed by Rossby waves, reaching up to the lower stratosphere. Warming episodes over a geographical area, covering the Barent Sea and the Polar Sea north from Central Siberia, displaced a polar vortex fragment extremely southwards. However, the vorticity was weak and the stratospheric temperatures did not reach low values, providing conditions for ozone chemical destruction via heterogenic reactions. At the same time, a Rossby wave ridge was located below the European polar fragment. In the period from 13 to 19 March, the thermal tropopause over Sofia was uplifting almost by 3.1 km. Ozone distributions observed by the SCIAMACHY instrument on 18-21 March show an fast TOC decrease westwards from Ireland, which was moving eastwards during the next days, increasing the area in which the ozone content decreased. On 20/21 March low ozone content was observed above the Stara Zagora (42^{o}N, 25^{o}E) ground-based station by means of the GASCOD instrument, using DOAS technique. The TOMS Earth probe instrument detected 237 DU over Sofia. This is a record in the low March values from the beginning of the TOMS instrument measurements in 1978. In March/April the ozone distribution was characterized by its annual maximum of 360 DU at 42^{o}N. The analysis of simultaneous O_3 and NO_2measurements allows us to deduce that the stratospheric atmosphere over the Stara Zagora region was very close to a steady state equilibrium and, consequently, the ozone decrease was caused mainly by the dynamical processes.

Using the TUV model, the UV-index was calculated for regions of 2000 m height, typical for the mountains southwards from Sofia. The UV-index was very high (almost 11). This is a result not only of the low TOC but also of the relatively high zenith angle at middle latitudes in March.