

Stratospheric ozone intrusions into the troposphere over Central Europe

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The budget of ozone, water vapour and other substances in the UTLS region is influenced by the transport and mixing across the tropopause. The research is based mainly on regular ozonesoundings performed in Legionowo, Poland (52.40 N, 20.97 E) since 1979. Until May 1993 the OSE ozone sensor of Brewer Mast type has been used and since June 1993 the ozonesoundings are continued with the ECC sensors. Special attention was paid to the ozonopause, defined as the bottom layer of ozone rich stratospheric air. In most cases the ozonopause can be found easily by visual inspection, but in some cases, the wavy structure of ozone profile or weak ozone gradient in the UTLS region make some difficulties. Profiles of temperature and relative humidity can give additional information. The analysis of mutual location of tropopause and ozonopause show cases of tropical advection (high tropopause) and cases of ozone intrusions into the troposphere (low ozonopause). For some episodes, dispersed throughout the year, the ozonopause descended down to the altitude of 4-6 km. For studying the origin of the air masses coming over Poland, the 3-D backward and forward trajectories are used. A unique episode of deep stratospheric intrusion into the troposphere occurred on the 11th October 2005. The ozone sonde launched at Legionowo on that day revealed record ozone amount in the troposphere (78 D), and record ozone mixing ratio near 4km (160 ppbv). During earlier episode, on the 4th August 1993, very high ozone values of 100-110 ppbv were observed at Legionowo in the layer 0.3-1.8 km, what is record high for the PBL. The main recognised causes of ozone abundance in the lower troposphere are the long lasting subsidence of air and polluted background air, advected or local, in which photochemical processes take place.