

Long term changes in the UTLS region over Central Europe

B. Kois, Z. Litynska

Institute of Meteorology and Water Management, Centre of Aerology, Legionowo, Poland,
Bogdan.Kois@imgw.pl / Fax: +48 22-7742746 / Phone: +48 22-7673118

Changes in the UTLS region over Central Europe are presented in connection with global changes during the last 20-30 years. The research is based mainly on the series of ozonesoundings and radiosoundings from Poland since 1979. Special attention was paid to two characteristic surfaces within the UTLS region – the thermal tropopause important for energy balance and the chemopause (ozonopause) relevant to the transport and mixing of mass and chemical species between the stratosphere and troposphere. The ozonopause is 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. A large change of the structure of the UTLS region has occurred in recent years. During the years 1989-2005, the ozonopause on the average was located about 200m below the tropopause, whereas the previous estimate for 1979-2000 situated the ozonopause about 600 m below the tropopause. It is also noted that the percentage of multiple tropopause has increased since 1979. The ozonopause is next used to separate the cases of tropical advection (ozonopause above the tropopause) from the cases of middle and higher latitude advection. Long term changes of temperature at the tropopause and at the ozonopause are examined in dependence of their mutual location. When the ozonopause was located above the thermal tropopause, the lowermost stratosphere above Legionowo cooled significantly during the years 1979-2005. During the same time, no significant temperature trend at the tropopause and ozonopause was present for advection from middle and higher latitudes. The annual temperature trend over Poland calculated from radiosonde observations for the same period 1979-2005 showed a significant warming in the lower troposphere and a significant cooling in the lower stratosphere. The enhancement of subtropical air mass advection to Poland in recent years contributed significantly to resultant negative temperature trend in the UTLS region.