



## **Trends of the surface ozone concentration from 1990 to 2005 at elevated sites in the Alps and in Caucasus region**

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Long-term trends of the surface ozone concentration are analyzed for two mountain sites, namely Kislovodsk High Mountain Station (KHMS) in Caucasus, Russia (43.7°N, 42.7°E, 2070m asl) and Jungfrauoch (JFJ) in Switzerland (46.5°N, 7.9°E, 3580m asl). A strong increase in ozone concentration (up  $+0.46 \pm 0.11$  ppb/year) was found at JFJ while ozone significantly decreased at KHMS ( $-0.65 \pm 0.09$  ppb/year) during 1990-2005. We compared trends for two periods from 1990 to 2001 and from 1993 to 2005. For the period 1990-2001 the trends are more significant at both locations (more positive for JFJ and more negative for KHMS). Among the possible reasons of the trends difference the origin of the arriving air masses is considered. Transport pathways are analyzed based on 3D trajectories using LAGRANTO. The subsets are filtered based on PV and trajectory altitude (to trace the cases of the contact with upper troposphere/stratosphere) and based on PBL height (to trace cases of the contact with the Planetary Boundary Layer). The role of horizontal advection is studied for different clusters obtained for both sites and both periods by means of k-means clustering algorithm. It is shown that for the earlier period there is no substantial difference between trends for different subsets, while for the later one estimated trends are less positive in PBL in comparison with upper tropospheric cases at JFJ. At KHMS

this feature is not observed. Principal difference between 1990-2001 and 1993-2005 nevertheless is observed in the seasonality of trends at KHMS for selected subsets with indication of less ozone decrease in the PBL for later years. Horizontal advection has also slightly changed for both location between 1990-2001 and 1993-2005, which seems to impact the observed trends. The difference in ozone source areas with most of time in the free troposphere over Atlantic for JFJ and prevailing air transport over the continent for KHMS is likely to be the main cause of the trend signs difference between KHMS and JFJ. The work is financially supported by the Swiss National Science Foundation (JRP IB7320-110831), European Commission (Marie-Curie IIF project N 039905 - FP6-2005-Mobility-7) and Russian Foundation for Basic Research (projects 06-05-64427 and 06-05-65308) and contributes to ACCENT T&TP project.