



Transport and chemical conversion in convective boundary layer above complex terrain

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In summer 2007, the TRACKS campaign (Transport and Chemical Conversion in Convective Systems) was carried out in southwestern Germany in order to study the transport of atmospheric trace gases and aerosols under convective conditions. One focus of this experiment was to investigate the dilution of air pollutants due to dynamical and chemical processes above complex terrain. Therefore, the dispersion of the plume of a metropolitan area has been detected by coordinated measurements of different airborne platforms, including several aircraft and a zeppelin.

This contribution addresses the plume of the city of Karlsruhe on a summer day when a convective boundary layer has developed. Karlsruhe is located in the upper Rhine valley between the Palatine mountains and the Black Forest. The transport of air masses is deeply influenced by this orographical situation. The case under investigation is characterized by moderate convective conditions, a frequently occurring summer situation with typical anthropogenic air pollution mainly resulting from traffic and industry. The dispersion of the plume will be shown, mass fluxes are determined and relations between meteorological conditions and trace gas concentrations inside and outside the plume will be discussed.

The results reveal a distinctive lateral boundary of the plume. At a distance of 40 km downstream the main emission area, the ozone concentration increased by about 10 ppb, although NO₂ does not show a clear horizontal gradient along the plume. In the afternoon, the aerosol in the range of nanometers indicates an unusual growth in size with increasing distance to the city area.