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SIMULTANEOUS DETERMINATION OF OZONE BY DIFFERENTIAL ABSORPTION LIDAR AND CONVENTIONAL SPOT ANALYSERS DURING PHOTOCHEMICAL SMOG EPISODES

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Within an extensive summer measurement campaign performed in the Czech Republic, ozone concentration values were acquired simultaneously with DIfferential Absorption Lidar (DIAL), aircraft, and automatic immission monitoring stations. The measurements were performed in two countryside locations (at a distance of 40-50 km from Prague), during the days of increased ozone concentrations presumed in the atmospheric boundary layer. The campaign's aim was twofold: to investigate ozone generation during the transport of atmospheric pollution from the Greater Prague urban area and to verify the DIAL measurement methodology itself. We employed the mobile LIDAR 510M system (ELIGHT Laser Systems GmbH, Germany), based on the Titan-Sapphire laser technique, together with calibrated spot monitors in order to estimate the error of the DIAL O3 determination. A good agreement between the data obtained simultaneously by the DIAL method and the calibrated analyser placed in the aircraft deck was observed. The best conformity in particular altitude layers was found in the case of homogeneous distribution of aerosols across the monitored area; the average relative error of the DIAL determination of O3 in a vertical profile did not exceed 5%. Data analysis further confirmed a very strong stochastic relationship (94.4 % and 97.5 % respectively) between ground ozone concentration values determined simultaneously by the DIAL method and the spot analyser of the automatic immission monitoring station. The average relative error of the DIAL determination of O3, in the concentration range from 50 mg•m-3 to 190 mg•m-3, was about 10%, at meteorological visibility VM > 15 km.