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An investigation of ozone and planetary boundary layer dynamics over the complex topography of Grenoble combining measurements and modeling

O. Couach¹, I. Balin¹, R. Jiménez¹, P. Ristori¹, S. Perego², F. Kirchner¹, V. Simeonov¹, B. Calpini³, and H. van den Bergh¹

¹Air Pollution Laboratory (LPAS), Swiss Federal Institute of Technology (EPFL) CH-1015 Lausanne, Switzerland

²IBM Suisse, Altstetterstrasse 124, 8010 Zurich, Switzerland

³SwissMeteo, Aerological Station, Payerne, Switzerland

Abstract. This paper concerns an evaluation of ozone (O₃) and planetary boundary layer (PBL) dynamics over the complex topography of the Grenoble region through a combination of measurements and mesoscale model (METPHOMOD) predictions for three days, during July 1999. The measurements of O₃ and PBL structure were obtained with a Differential Absorption Lidar (DIAL) system, situated 20 km south of Grenoble at Vif (310 m ASL). The combined lidar observations and model calculations are in good agreement with atmospheric measurements obtained with an instrumented aircraft (METAIR). Ozone fluxes were calculated using lidar measurements of ozone vertical profiles concentrations and the horizontal wind speeds measured with a Radar Doppler wind profiler (DEGREANE). The ozone flux patterns indicate that the diurnal cycle of ozone production is controlled by local thermal winds. The convective PBL maximum height was some 2700 m above the land surface while the nighttime residual ozone layer was generally found between 1200 and 2200 m. Finally we evaluate the magnitude of the ozone processes at different altitudes in order to estimate the photochemical ozone production due to the primary pollutants emissions of Grenoble city and the regional network of automobile traffic.

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