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Diurnal cycle and turbulence evaluated by remote sensing and numerical weather prediction model during a winter stable period

Guylaine Canut, Pauline Martinet, Alexandre Paci, and Tiphaine Sabatier
CNRM, Météo-France UMR 3589 CNRS, Toulouse, France

Urbanized valleys are particularly vulnerable to particulate air pollution during the winter, when groundbased stable layers or cold-air pools persist over the valley floor. The Passy-2015 field experiment which took place during the winter 2014-2015 in the Northern Alps aims at improving the understanding of the atmospheric dynamics during wintertime anticyclonic condition. In such meteorological conditions, the small scale turbulence influences the dissipation of cold air masses and has a major role in the air pollution dispersion.
Because of their variability and their sensitivity to local conditions, these turbulent phenomena are especially difficult to model.
Weexamine data from a combination of remote sensing (UHF wind profiler, microwave radiometer and Doppler Lidar) to study the atmospheric conditions during the pollution events. The Doppler Lidar (Windcube 8, Léosphère) provided by Air Rhone Alpes, the local air pollution agency, combines five laser beams that allows to restore the vertical profiles of the three wind components at high frequency and up to 300 meters.
The purpose of this presentation is to (i) evaluate the moments of order 2 of the three wind components and the turbulent kinetic energy (TKE) (ii) to evaluate the atmospheric numerical models by continuous remote sensing data in the atmospheric boundary layer and also (iii) to study the diurnal cycle of the turbulence in the stable condions.
To validate the mean parameters, 90 radiosoundings serve as a reference. Concerning the turbulence of lidar data is the sonic anemometer measurements the reference.
Having continuous vertical turbulent data presents an interest to the evaluation of the atmospheric numerical models because TKE is taken into account to estimate the turbulence inside the boundary layer. Very few vertical observations in order to evaluate the turbulence produced by models were available. An evaluation study of Météo-France numerical models, Arome during two intensive observation periods (IOPs) shows that the models reproduced correctly the diurnal cycle of the turbulence but differences on the intensity of the turbulence are highlighted. This study highlights the new possibilities offered by high resolved observations of wind and turbulence with lidars for instance in order to improve the understanding of turbulence through the boundary layer.