New data of dry deposition velocity of sub-micron aerosol on several rural substrates and comparison with models.

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Key words: Dry deposition, ELPI, Atmospheric aerosols

INTRODUCTION
Dry deposition flux is the quantity of particles deposited per unit surface and time. The dry deposition velocity is obtained by dividing the deposit flux by the aerosol concentration measured in the air. The lack of experimental data on dry deposition velocities of sub-micron aerosols in a prairie creates uncertainties larger than one order of magnitude for operational models. In this work we present the new results on several substrates and quantified them as a function of aerosol sizes and atmospheric turbulence parameters.

MATERIAL AND METHODS
Dry deposition flux can be calculated from the covariance between fluctuations of the vertical wind velocity and fluctuations of the atmospheric aerosol concentration. The aerosol concentration was measured with an Electrical Low Pressure Impactor (ELPI, Dekati, Inc.) and the wind by an ultrasonic anemometer for 30 minutes at high frequency. The vertical calibration of parameters to validate measurements (stationarity, integral characteristic of turbulence, Foken & Wichura, 1996), then spectral analysis and the calculation of fluxes were done. Three experimental campaigns were conducted in southwestern France in order to carry out the methodology on several substrates (maize, grass and bare soil).

RESULTS
Measurement provided values of dry deposition velocities (Vd) of sub-micron aerosols. The friction velocity (U*) and the heat sensible flux (H) have simultaneous effect on the deposit phenomena, because they influence the atmospheric turbulence These effects can be taken into account simultaneously by parameterizing Vd/U* as a function of the inverse of Monin-Obukov length (Wesely, 1985).

For neutral and stable atmospheric conditions, the dry deposition velocities are shown on the figure1. Vd is plotted as a function of the aerosol size and normalized by U*. Operational models (Slinn 1982, and Zhang et al. 2002) are also plotted on the same graph. Vd/U* results are very close for every substrates. Furthermore, a discrepancy between models and measurements is observed for aerosol greater than 0.5 µm.

CONCLUSION
We present our results: discuss the impact of micrometeorological parameters and particle size on the dry deposition velocity. The perspective of work is to apply this method on other substrates: urban, forest or other rural substrates.


Figure 2. Dry deposition velocity measurements and models on different rural canopies