Geophysical Research Abstracts,
Vol. 11, EGU2009-3958, 2009
EGU General Assembly 2009

New experimental data for validation of nanoparticle dry deposition velocity models

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In Order to evaluate the impact of the aerosol pollution on ecosystems, we have to study the transfer functions of particles on vegetated canopies. One of them is the dry deposition, which is defined by the deposition velocity (Vd): the ratio between particles surface flux and the atmospheric aerosol concentration nearby the surface. This deposition velocity depends on many parameters. For example, the topography ground, the substrate, the micrometeorological conditions (turbulence), the aerosol characteristics (size, electric charge) and external fields (gravity, electric).

Nowadays, there are several models of aerosol dry deposition which consider the effects of the turbulence, the particles size for a large range of diameter (some nm to 100 μm). In the case of nanoparticles, there is not enough reliable experimental data to allow a comparison with the dry deposition models. For operative models, the scattering of Vd experimental data of nanoparticles in a rural environment creates uncertainties larger than one order of magnitude. The study of the aerosols dry deposition velocity has remained an international challenge since the sixties and involves an in situ experimental approach, in order to consider the local particularities (substrate, turbulence, vegetated canopies, etc. . .)

The main aim of this study is to obtain experimental data on aerosol dry deposition velocities onto rural areas. Therefore we have developed a direct eddy covariance method. The use of an Electrical Low Pressure Impactor (Outdoor ELPI, Dekati Inc.) for this method enables to calculate dry deposition velocities for atmospheric aerosols sizing from 7 nm to 2 μm.
We present our results: discuss the impact of micrometeorological parameters and particle size on the dry deposition velocity and the possibility to apply this method on other environments.