

Author's Accepted Manuscript

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PII: S0021-8502(17)30455-X
DOI: <https://doi.org/10.1016/j.jaerosci.2018.08.004>
Reference: AS5324

To appear in: *Journal of Aerosol Science*

Received date: 21 November 2017
Revised date: 24 July 2018
Accepted date: 14 August 2018

Cite this article as: O. Connan, G. Pellerin, D. Maro, P. Damay, D. Hébert, P. Roupsard, M. Rozet and P. Laguionie, Dry deposition velocities of particles on grass: Field experimental data and comparison with models, *Journal of Aerosol Science*, <https://doi.org/10.1016/j.jaerosci.2018.08.004>

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Dry deposition velocities of particles on grass: field experimental data and comparison with models

ACCEPTED MANUSCRIPT

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Keywords

Dry deposition velocities; Atmospheric aerosol; On site measurement on grass; fluorescein

Abstract

Aerosols emitted into the atmosphere are dispersed by atmospheric air masses and then removed by dry or wet deposition processes. In some cases, if there are no episodes of precipitation, dry deposition may be the main processes in particular on a local scale. Dry deposition is characterized by the dry deposition velocity V_d ($\text{m}\cdot\text{s}^{-1}$), which is generally standardized at the friction velocity u^* ($\text{m}\cdot\text{s}^{-1}$). From 2005 to 2016, we conducted experimental campaigns on-site with fluorescein tracer to determine dry deposition velocity of aerosols on grass. The particle sizes tested were 0.24, 0.27, 0.5, 0.6, 1.2, 3, and 7.8 μm . We described here the experimental method, the results obtained in terms of V_d/u^* by particle size and we compared our results to the values usually simulated from the main models used by the scientific community. The results show that the V_d/u^* parameter varies in a range from 2 to 6 10^{-3} for particle diameters from 0.2 to 1.2 μm . Beyond 1.2 μm the V_d/u^* ratio increases rapidly with a value of 5.4 10^{-2} to 7.8 μm . Based on our experimental results, V_d/u^* relationships were proposed for potential applications in operational models for a grass-type rural cover, which has a constant mean value of $3.7 \pm 1.9 10^{-3}$ for particles in the size range of 0.2 and 1.2 μm , and as a linear function of particle size (D_p , diameter) expressed as $0.0082 \times [D_p] - 0.0106$ for larger particles between 1.2 and 8 μm .

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