

Interactive comment on “Measurements of dust deposition velocity in a wind-tunnel experiment” by J. Zhang et al.

Anonymous Referee #2

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General comments

The manuscript “Measurements of Dust Deposition Velocity in a Wind-Tunnel Experiment” presents results of dust deposition velocity from direct measurements in a wind tunnel. It develops a new method which measures the individual particle motions directly using single instrument based on particle dynamic analysis, which can get data of both particle velocity and particle size. The particle deposition velocity as a function of particle sizes at different wind velocities and land surfaces are presented. The data obtained was used to compare with and test a dust deposition model scheme for smooth surfaces (wood and water surface) and rough surfaces (sand, sandy-loam, Gobi and trees surface), through which the incompetency of the scheme and thus the need for improvement were recognized. This study provides a new method for parti-

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cle deposition velocity measurement and has enriched the data set of dust deposition velocity, which is helpful to validate the deposition scheme in the model. I recommend its publication in Atmospheric Chemistry and Physics if the follow question can be addressed. The deposition velocity obtained here is based the model particle SiO₂, which is spherical. This will serves as reference data to validating deposition scheme model. I am wondering how ambient relevant are the results here considering the difference of the lab particles and ambient dust particles in term of particle size distribution, particle shape and density. For example, shape of dust particles are usually non-spherical and may have different densities. Wind speed is an important parameter in this study. But the measurement of wind speed was not mentioned in the experimental part.

Specific comments

1. Pg 9442, line 4, specify which devices you are referring to (for fluxes and concentration?) and what uncertainties that the authors refer to. Elaborate a little on the advantage of the method.
2. Pg 9443, line 4-5, does this “multi-light detector” include several “different detectors”? It does not sound very clear for me.
3. Pg 9444, line 9-10, is the bounce also not possible on the wood surface?
4. Pg 9445, line 9-11, is the particle size resolution determined by instrument or just data analysis? The arithmetic average diameter is used here. But when it comes to the terminal velocity (Eq. 6, Pg 9447, line 4), the terminal velocity is proportional to D_p^2 . The wt of upper limit of one bin is much different than the lower limit of the bin, for example, there is nine times different for the bin 0.5-1.5 μm ! Then when calculating wt, a geometric mean seems to be more reasonable. I am wondering how sensitive is the deposition velocity to wt.
5. Pg 9446, line 20, is Δt determined by “time interval between the peaks of the pulses” as indicated in Pg 9442, line 25? If so, clarify it.

6. Pg 9447, line 2, Eq. 5, for a certain size bin, when calculating w_d , is the same D_{pi} used for all particle in this size bin? If so, D_{pi} can be omitted from the equation to make it simple.
7. Pg 9448, line 3-5, is $(w_p - w_p)N_j$ the standard deviation of the subset N_j ? . It is not very clear for me that why the Eq. 7 is used in such a way. Please elaborate it.
8. Pg 9448, line 13, how is Z_d determined?
9. Pg 9449, line 10, the figure “not shown” can be shown in the appendix.
10. Pg 9449, line 17-18, from Fig. 11, one can not tell w_d increase “linearly” with friction velocity. Maybe just state “increase”.
11. Pg 9449, line 17-18, by “ w_p ”, do you mean w_d since w_p is not shown here?
12. Pg 9450, line 20, from Fig. 13, one cannot tell with which existing studies have you compared? Do you refer to the general range of all the studies in Fig. 1 or only part of them? Considering that w_d seems to strongly depend on the surface materials, it is good to know that you are comparing similar things(although not much data in the literature on similar materials). And specify the dashed line is for w_t in the caption.
13. Pg 9451, line 18-20, the comparison of different surfaces are only mentioned in the summary but not covered in the results part. Also the measuring height of tree surface is different from other surfaces, is the deposition velocity comparable?
14. Fig. 9 can be put in the appendix since it is not a key figure. Technical comments
1. Pg 9454, line1 and line 4 are same references but different year. Please check.

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