Additional response to the comment 2 of anonymous referee #1

Comment

2. The study stated that earlier models predict reasonable deposition velocity over smooth surfaces but underpredict over rough surfaces. Note that the model of Zhang et al. (2001) actually predicts reasonable deposition velocity over rough surfaces and possibly overprecits deposition velocity over smooth surfaces (as shown in Petroff and Zhang, 2010). If the study really wants to demonstrate that earlier models are not suitable for rough or smooth surface, it should include comparisons with some of these earlier models (codes of these models should be available from those authors).

Response:

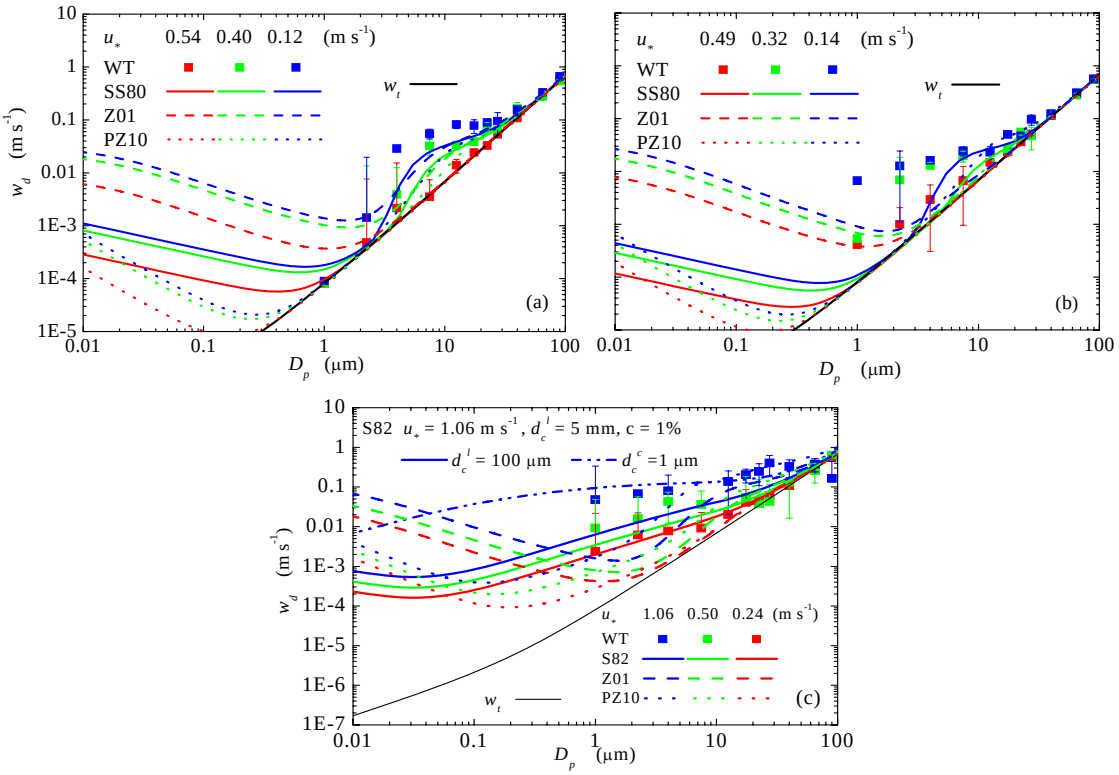

Fig. 1: Comparison of deposition velocity predicted by the SS80, S82, Z01 and PZ10 schemes (lines) with wind-tunnel measurements (symbols) over three different surfaces: (a) Sticky wood; (b) Sand; (c) Tree. The wind field parameters of the schemes are consistent with relevant wind-tunnel experiments.

The deficiencies of the existing particle dry deposition schemes are clearly revealed in our recent comparison of the Slinn and Slinn (1980, SS80 hereafter), Slinn (1982, S82 hereafter), Zhang et al. (2001, Z01 hereafter) and Petroff and Zhang (2010, PZ10 hereafter) with the wind-tunnel observations, as described in the companion paper by Zhang et al. (2014). The results of the latter study are summarized in Figure 1 which shows that the performances of existing particle dry deposition schemes are unsatisfactory, especially for rough surfaces (e.g. surface with trees). Considering that the Z01 and PZ10 schemes are based on field observation dataset and some uncertain factors or effects (such as atmospheric convection and complex surface conditions) can not be perfectly simulated in wind-tunnel (but the effects may be involved in the coefficients of Z01 and PZ10), we intend to employ the SS80 and S82 for the following discussions in this paper. As shown in Figure 1c, the model-observation discrepancies can be reduced by tuning some input parameters of S82, but the parameters become physically unrealistic.