Review of "Seasonal variation in size-resolved particle deposition and the effect of environmental conditions on dry deposition in a pine forest"

The authors present a study focusing on seasonal variation in size-resolved particle deposition velocities above a pine forest in central Colorado. Therefore, particle number flux measurements from each of the four seasons were compared to different model combinations in order to explain the increase in deposition velocity in winter. The authors demonstrated that turbophoresis is an important process which should be integrated into the model for a better deposition velocity estimation. However, this process does not completely fill the gap between measurement and model results. This problem is solved by increasing the interception scaling coefficient in the Emerson et al. (2020) model. The authors hypothesize that the interception scaling coefficient needs to be increased accounting for physiological properties of needles in winter time.

The manuscript is well structured and the different sections well described. I recommend the publication of the manuscript after a few minor corrections.

Specific comments:

L17 (Abstract): „Particle concentrations and therefore fluxes were highest … "
Fluxes and concentrations are related, but they do not necessarily react in the same way. Therefore, I would delete the word "therefore" in the sentence. (Same in L47)

L99 – L108: Although the site is described in detail by Ortega et al. (2014), it would be nice to get some information about the measurement height of the different variables. Are all variables measured at the same height?

Figure S2: Why roughness length varies with an amplitude of a few meters during the day? In L 514 you described that the roughness length of a needle leaf forest ranges from 0.8 to 0.9 m. How does this fit together? In addition, assuming that the roughness length is 0.1 times the canopy height, this means that the height of the surrounding trees varies between 10 and 40 meters. Is this correct? Furthermore, I assume that a diurnal variation in roughness length can only occur if the surrounding canopy height differs with wind direction and certain times of day are associated with certain wind directions.

L131: Were particle losses corrected with the method described by Von der Weiden et al. (2009) or was the correction neglected due to the small influence?

Table 1: What does daytime mean? 10:00 to 16:00 local time?

Figure S4: Maybe another color than red for the filtered data points would be better. In a black/white print, the red dots are not really different from the black ones.

L269: Do you mean with "stability" the stability parameter ((z-d)/L)?

L324: Please be careful with the word "largest" because of the negative sign of deposition fluxes. The particle number fluxes are, in the strict sense, smallest and not largest in summer and spring.

L377-L378: What do you mean with "stability function"? Do you mean the stability parameter?

L481/Figure 8: Are the literature values modeled or from measurements?

L583 – L586: What do you think why the turbophoretic included model (Emerson et al. (2020) + E_{turbo}, C_{in}=5) shows a worse agreement than the isolated increased interception model results (Emerson et al. (2020), C_{in}=5)? Since turbophoresis also influences dry deposition with the same tendency (cf. chapter 3.3.2), I would expect the opposite here.

Technical corrections:

L62: “size resolved” (hyphen is missing)

Figure S1: Please add explanations of the abbreviations (e.g. MFC and UHSAS) to the figure caption.

L153, L197, L214, L221, L231, L377: windspeed → wind speed (with space character)

Table 3: Please add the explanation of the abbreviation LOD. The explanation in the text follows later on the next page.

L333: 129 ± 8 instead of 128 ± 8 nm for the winter median diameters (cf. Table S1).

Table S1 and S2: Please add the unit of the numbers to the table (e.g. in table caption).

L555: I think you mean “µm” instead of “um”?!

Figure S14 (right): I think the unit °C in the figure legend for γ is not correct (contradictory to the text in L545/546).