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The Cryosphere Discussions

Interactive comment on "A simulation of the large-scale drifting snow storm in a turbulent boundary layer" *by* Zhengshi Wang and Shuming Jia

Anonymous Referee #1

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In this manuscript, the authors used the large eddy simulation combined with the Lagrangian particles motion model to calculate the large-scale drifting snow storm. While their basic idea is interesting, the paper needs a revision before been published. The points of criticism are discussed in more detail in the following. (1) The author simulates the drifting snow storm in the manuscript. What are the differences between the drifting snow storm and the general blowing snow on the physical mechanism? How is it reflected in the model of this manuscript? (2) The mesh size set in this manuscript is much larger than the particle size. How do you determine the wind speeds of the particles position when calculating the particles motion? (3) The author mentions that a particle represents one particle parcel in Section 2.4. How many particles does the

particle parcel contain? What is the time step for calculating the particles? (4) The author mentions that the bottom boundary condition of the particles is calculated by Section 2.3, but Equation 12 shows that the impact and lift-off particles are the same, how does the particle in the air increase? (5) The author cites the work of Vinkovic et al. (2016) in Equation 4. The SGS velocity in the work of Vinkovic et al. (2016) is attached to the solid particles, but the author seems to attach it to the flow field. Why? (6) The result that the proportion of particles below 100 μm in the particle size distribution at 0.05 m in Figure 5 of this paper is obviously smaller than that of the experimental results. Why? (7) Figure 6a shows that the rate of snow transport flux has a mutation at 1 m, while the rate of the average particle size of snow particles in Figure 4 also has a mutation at 1 m. Is there any relationship between them? (8) Figure 10 shows that the thickness of drifting snow storm eventually developed to about 900m. Is this because the author set the upper boundary to 1000m? If the upper boundary is set higher, will the thickness of drifting snow storm continue to increase? (9) The author mentions that the particles enter the high-altitude causing by large-scale turbulence structure. Therefore, the authors show the distribution of airborne particles with and without consideration of atmospheric turbulence in Figure 2 and Figure 8 respectively. What are the differences between the two examples in Figure 2 and Figure 8 when calculating the flow field? What equations are used to calculate atmospheric turbulence? In addition, the author should give a comparison of the flow field structure in these two cases, so that the readers can understand this part of the content more clearly. (10) The author gives the vertical wind speed bubbles (1 m/s) in Figure 9, indicating that the particles are substituted into the upper air by the ascending airflow. Why use a 1m/s here? Is it the critical speed at which the particles become suspended particles? (11) There are some writing errors in this manuscript. For example, 'is' should be changed to 'are' in line 313 of page 19.

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