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Interactive comment on "Blowing Snow Sublimation and Transport over Antarctica from 11 Years of CALIPSO Observations" *by* Stephen P. Palm et al.

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This manuscript introduces the new approach to evaluate the blowing snow sublimation and the transport over Antarctica based on the CALIPSO satellite data and model reanalysis data product of MERRA-2. So far, authors contributed largely to reveal the extent and structures of the blowing snow over Antarctica with introducing the technique of satellite data analysis. It was certainly revolutionary in the blowing snow research community. Subjects are topics of conversation on these days and the idea described in this manuscript is also ambitious and attractive. Thus, the attitude should be highly evaluated. However, throughout the manuscript, numerous questions arose as shown below. These should be satisfactorily addressed before the paper can be accepted for

the publication. First of all, previous works are well reviewed in general except for the field observation lately carried out, such as Trouvilliez et al., 2014. Line 156: Here new logic to detect the blowing snow is introduced. I wonder how the new one gives effect on the blowing snow detections shown in the authors' previous publications (overestimate, misrecognize or negligible?). Line 185: Particle sizes of cirrus clouds are around 5 micron and are much less than the blowing snow particles. Is the same algorithm still applicable? Line 209: The definition of particle radius seems too rough, since the sublimation rates (vapor pressure) strongly rely on the particle radius. Although, latter part of the manuscript on line 450, authors estimated the error caused by the radius is 10 %, I believe the contribution cannot be assessed by such a simple product. Line 221: Observations by Mann et al. should be done much lower altitude than the one discussed here. Is it worth comparing? Fig. 2: Particle density profile shown here is very interesting, however, at the same time, it is very confusing. Please explain the physical mechanism why the particle density increases with height, as far as I know it should be opposite, and shows the maximum at 100 m. Line 239: Fk and Fd should be expressed in italic. Line 230: Kg → kg Line 256: Once the sublimation is generated in the specific grid, the properties of air, such as the temperature and the humidity, change and then flow into the next downstream grid. Obviously, amount of sublimation decreases along the flow except for the case of the drastic temperature rise. It looks this process is not taken into account in the procedure shown here. If this is the case, I am afraid it overestimates the sublimation amount largely and caused the difference with the previous research.. Further, the accuracy of the MERRA-2 data needs to be indicated because they are also the key for the following estimates. Since a number of AWSs exist over the Antarctica, comparisons with these measurements must be done, or at least be referred, and show the MERRA-2 data are precise enough as the input data. Line 347: Since the sublimated vapor does not always contribute on the sea level rise, I suppose this part is meaningless. Line 351: If this really the case, it is of great interest. Since the authors have all the ingredients (factors) to deduce the sublimation amount, the reason which brought the annual change can be conjectured, I believe. More detailed considerations are recommended. Line 413: When we discuss the amount of sublimation and transport quantitatively, the blowing snow from the surface to 30 m, where this satellite technique is not applicable, cannot be neglected. As far as I know, the flux increases with decreasing height on the contrary to Fig. 2. Although the particles may suspend as high as 300 m, most of the transport concentrate within 0 to 30 m layer. It should be also taken into account in the error analysis. Recently, Huang et al.(2016) published the manuscript on Atmospheric Chemistry and Physics and discussed the impacts of moisture transport on drifting snow sublimation in the saltation layer. Thickness of the saltation layer is less than 0.1 m in usual, nevertheless, they say that the blowing (drifting) snow sublimation is important on the distribution and mass-energy balance of snow cover. Line 458: It the estimates of the error amounted to large as 40 %, the conclusion that ‘the sublimation amount is about the twice the one of the previous studies’ on line 478 is not always the case.

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