Atmos. Chem. Phys. Discuss., 15, C8527–C8529, 2015
www.atmos-chem-phys-discuss.net/15/C8527/2015/

Atmospheric Chemistry and Physics Discussions

ACPD
15, C8527–C8529, 2015

Interactive Comment

Interactive comment on "The impact of atmospheric mineral aerosol deposition on the albedo of snow and sea ice: are snow and sea ice optical properties more important than mineral aerosol optical properties?" *by* M. L. Lamare et al.

Anonymous Referee #1

Received and published: 26 October 2015

1. Page 23132, line 14 "On the contrary, multiple layers of mineral aerosols deposited during episodic events evenly distributed play a similar role in the surface albedo of snow as a loading distributed throughout, even when the layers are further apart". This sentence is really awkward to read without knowing the details of this study a prior. Do the authors mean that the albedo of two equal-depth snowpacks are similar as long as the dust loading of these two snowpacks are same, regardless of the number and positions of dust layers? This is a key message of the paper, and it should be made clearer.

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

2. Equation (2), shouldn't the mass absorption coefficient of sea ice equals to the sum of mass–weighted absorption coefficient of different materials (i.e. ice and mineral aerosols) within the study medium? Mass absorption coefficient of different materials cannot be added directly. Is this equation only applicable to sea ice? What about snow?

3. Page 23138, line 13. "Data on the typical wavelength dependant refractive index of mineral aerosols is scarce in the literature". More data and references on refractive index of dust can be found in Figure 7 of paper: Dang, C., R. E. Brandt, and S. G. Warren (2015), Parameterizations for narrowband and broadband albedo of pure snow and snow containing mineral dust and black carbon. J. Geophys. Res. Atmos., 120, 5446–5468.doi: 10.1002/2014JD022646 . This might be useful for the authors' future research.

5. Section 2.3, these experiments are very comprehensive. It would be good to add a diagram to illustrate the different schemes.

6. Page 23141, line 29. "The snow grain radius parameter was varied in SNICAR-online to fit three types of clean snowpacks to the output of TUV-snow". Does SNICAR online output scattering cross-section? If yes, are the scattering cross-sections similar?

7. Table1: besides the values given in this table, it might be good to include the equivalent snow grain radius as well, since it is a commonly used parameter to character the type and age of snow. According to the comparison with SNICAR, the radii are 85 microns for cold polar snow, 220 microns for costal wind pack, and 1400 microns for melting snow.

8. Figure 9: two consecutive dust events that each produce 800ng/g dust loading seems to be unusual in a short time period. Does the author have a feeling about the observed snow thickness between two such large dust events? In another word, would the distance between dust layers more similar to 8 cm? If in that case, it seems that only the surface dust layer matters for snow albedo.

ACPD
15, C8527–C8529, 2015

9. For the figures that only show relative albedo change, please add the albedo that compared against with as well. A relative change in albedo cannot be converted to energy change directly, which is what actually matters to snow/ice energy budget. Some readers may want to do a quick calculation.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 23131, 2015.