

Interactive comment on “Three examples where the specific surface area of snow increased over time” by F. Domine et al.

F. Wania (Referee)

frank.wania@utoronto.ca

Received and published: 25 September 2008

This is a well written and thoughtful manuscript reporting on three instances where increases in the specific surface area (SSA) of snow have been recorded in the field. It is well referenced and has excellent illustrations.

My only major comment is that I remain somewhat unconvinced about the real significance of the observed increases in snow SSA. The author do provide calculations that show the impact of the changes in SSA on albedo, but those changes appear rather small and are therefore not very effective in conveying the importance of the SSA increases. I suggest the manuscript could be a bit more explicit about the potential significance of the snow SSA increases. For example, can the authors provide a sense of the significance of albedo variations on the order of 1%. Are such small variations

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



larger than the uncertainty of albedo measurement? Are such variations relevant for climate variability? The same applies to the sorption for organic contaminants. Can the observed variations in snow SSA have a significant impact on the behaviour of those contaminants, considering that other factors (temperature, air concentrations, etc.) undergo changes on the same time scale that are relatively much larger than the observed changes in SSA.

Related to this issue, I wonder whether it is justified to state the need to include the possibility of snow SSA increases in chemical and climate models (Page 650, line 16). Has it really been shown to be significant? And do we really already have the quantitative process understanding that would allow us to do so?

Otherwise, I only have some minor suggestions and corrections:

Some references appear to be missing from the list of references, e.g. Warren, 1982, Sturm and Johnson, 1991. Page 650, line 23: It is not obvious what "optics models" are? A more descriptive name for those models would be helpful. Page 651, line 21: I suggest it should be "storage capacity"; rather than "storage". How much chemical is stored in the snow pack depends on a whole range of different factors (temperature, air concentrations, etc.) in addition to snow SSA. Page 652, line 6: "produced their fragmentation" sounds odd. Rephrase: "reduced the size of snow crystals by sublimation and fragmented them" or "reduced the size of snow crystals by sublimation and fragmentation". Page 653, line 12: Delete "in" Page 654, line 7: "that" should be "than" Page 655, line 2: Replace "previous" with "previously deposited" Page 655, line 3: Replace "was made" with "consisted" Page 655, line 5: I suggest to qualify this sentence by adding "presumably": "The SSA increase is presumably due to" Page 657, line 23ff.: This sentence seems to be grammatically flawed. As it is, it appears to suggest that the melt layer transform to something that has a higher SSA than the melt layer. I think it could be fixed by simply deleting "than the melt layer" at the end of the sentence. Page 658, line 7: It should read: "on the snow pack's ability to store" Page 658, line 23: "accelerated SSA decrease" Page 659, line 9: "will increase albedo" Page 659, line

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

11: Delete the second "then" Page 659, line 14: Replace "extra" with "additional" Page 659, line 15: Delete "and" Page 659, line 23: "on the order" Page 670, Figure 5: Why are the original SSA values measured right after snow fall not included in this figure? I think it would be helpful, because it puts the increase in snow SSA in perspective relative to the snow SSA decrease that occurred earlier in the snow pack.

Interactive comment on The Cryosphere Discuss., 2, 649, 2008.

TCD

2, S306–S308, 2008

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

S308

