

Cloud effects on surface energy and mass balance of Brewster Glacier, New Zealand

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General Comments:

I find that the authors have responded adequately to the comments, and believe the manuscript should be published. Some minor suggestions are provided below. I apologize for the delay in submitting this review.

I still have a problem with the discussion of an “albedo feedback” caused by the change in precipitation phase, since there is more involved than albedo, specifically the energy supplied to the snowpack from rain, and because “albedo feedback” is generally used to refer to a darkening of the surface caused by increased melting of snow and ice, which includes, but is not limited to the change in precipitation phase. I think that if possible a different term should be used to refer to this particular feedback mechanism, although in some cases (e.g. Section 3.5) the term is appropriate as the authors are specifically looking at the effect of surface albedo change.

Specific Comments

- 1. Title:** Suggest adding “the” between “on” and “surface”.
- 2. P. 2, Lines 9-11:** The sentence is somewhat vague and unclear. Change “through a much greater length of time” to “for a greater fraction of time”, or better, provide specific numbers. What is meant by “led to similar melt in each sky condition”? Isn’t more melting produced as a result of cloudy conditions? Please revise.
- 3. P. 3, Lines 8-10:** I assume this means evaporation, sublimation, and blowing snow can be ignored. But what does being “debris free” have to do with this? Also change “product” to “sum” for clarity. Is there a reference that can support this statement?
- 4. P. 3, Lines 13-15:** As this is the introduction, I think it makes sense to discuss the albedo feedback in general here, and then discuss the particular component associated with a change in precipitation phase: Warmer temperatures lead to melting of snow and ice and an increased fraction of precipitation falling as rain, producing a darker surface resulting from the presence of water, increased snow grain size due to snow grain metamorphism, and/or exposure of darker material beneath snow/ice. This leads to amplified warming associated with increased absorption of solar radiation.
- 5. P. 3, Line 19:** Change “nuanced” to “modulated”. “Nuanced” seems to diminish the importance of these factors.
- 6. P. 4, Line 12:** Suggest changing “albedo feedback” to “positive feedback”
- 7. P. 5, Line 1:** I think it’s a bit of an overstatement to say “this paper addresses these issues”, since only a single site is discussed here. Please revise.
- 8. P. 5, Line 2:** Change “Brewster Glacier” to “Brewster Glacier, New Zealand” for clarity.
- 9. P. 5, Line 8:** Change “used” to “also used” to make it clear that this is not the only version that is used.
- 10. P. 5, Line 17:** Change “Southern Alps” to “Southern New Zealand Alps” or “Southern Alps, New Zealand” as this is the first time they are being introduced.
- 11. P. 6, Line 3:** Change “(8 °C)” to “(with a range of 8 °C)” for clarity.

12. **P. 6, Lines 17-20:** This description is unclear. Please provide some more details. Why was it necessary to construct this dataset? Was there some formula used to convert precipitation in the lowland area to glacial precipitation? To what area does the updated dataset apply?
13. **P. 7, Line 8:** I don't believe e_a is defined earlier.
14. **P. 9, Line 12:** Add "over the snow surface" after z_{0q} for clarity.
15. **P. 9, Line 14:** Change "over snow" to "over snow relative to ice" for clarity.
16. **P. 9, Line 19:** How is the "range of input data" defined?
17. **P. 13, Lines 2-4:** This statement appears to contradict the previous one. Please clarify.
18. **P. 15, Lines 7-8:** Melt occurs more frequently in overcast conditions, but overcast conditions do occur more often as well, so there must be some contribution associated with the frequency of overcast conditions. Please clarify.
19. **P. 15, Line 22:** Suggest changing "modest change in" to "modest response of".
20. **P. 17, Line 1:** Again, I suggest replacing "albedo feedback" with "rain-snow fraction feedback" or something similar.
21. **P. 17 Line 31:** "periods with altered snowfall" are not removed but the influence of altered snowfall on albedo has been removed. There is also likely an impact of heat directly from rain here.
22. **P. 21, Line 22:** Suggest changing "SEB with cloudiness" to "SEB terms with cloudiness", since the overall SEB doesn't seem to change much.
23. **P. 21, Line 23:** Add "and higher e_a " after "diminished T_a ".
24. **P. 22, Line 7:** add "to temperature" after "SMB".

Technical Corrections:

1. **P. 4, Line 6:** Change "poses" to "pose".
2. **P. 10, Line 11:** Change "parameterisation" to "parameterisations".