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The Cryosphere Discussions
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Interactive comment on "Reconstructing the mass balance of Brewster Glacier, New Zealand, using MODIS-derived glacier-wide albedo" *by* P. Sirguey et al.

J. E. Box (Referee)

jeb@geus.dk

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The study makes application of NASA MODIS optical radiances to estimate broadband surface albedo an using original approach, here applied to Brewster Glacier, Southern Alps, New Zealand. Concurrent winter and summer mass balance from field surveys correlate strongly with cumulative winter albedo and minimum ablation season albedo, respectively. The empirical relationship is used to ad 50% (5 years) to the existing the Brewster Glacier labor intensive field mass balance series. The MODIS retrievals are aided in identifying cloud artifacts by surface albedo measurements from a Brewster Glacier AWS.

The study elegantly makes mass balance inferences using the a-priori satellite data

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and conclude among other things that over "the 2000-2013 period, the extended record shows that Brewster Glacier exhibited an overall shift from positive mass balance from 2000 to 2007 to negative mass balances from 2008 to 2013 (0.74 to -0.69 m w.e. 10 on average, respectively)." The study further extends the MODIS-assisted mass balance series with a mass balance record before 2000 to 1977. The study interprets periods of positive and negative mass balance tendency resulting from shifts in the Pacific (Inter-) Decadal Oscillation (PDO/IPO).

Critique The study is not only very clearly written and illustrated and free from obvious methodological problems, it drives forward a powerful observation-based approach that begs to be applied elsewhere.

Comments

The study mentions "minimum glacier-wide albedo is an appropriate proxy for mass balance in this maritime environment", while no explicit framing of appropriateness for the maritime environment is argued, presumably vs. continental or polar environments. Discussion of the appropriateness vs continental, maritime, polar, etc. is warranted and would add depth to the study.

Briefly describe the "glaciological method" referred to used to obtain field-based mass balance

Consider replacing "shows" with "illustrates" when referring to figures and "lists" instead of "shows" when referring to tables

pg. 12 sentences beginning with "This" are less easy to follow lines 19-20 define difference between standard error and standard deviation line 21 remove "highly" and other ambiguous adverbs line 25 not just metamorphism but surface accumulation of light absorbing impurities will contribute to albedo decline line 27 define "It"

pg 15 line 11 "the glacier gained up to 14.5 $\pm$ 2.7 m w.e" in average thickness? Please specify.

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Fig 7. is problematic, e.g. with solid circles obscuring something? use colored open symbols to reduce coalescence? Further, Fig. 7 did not add much. Even the authors state "This does not reveal any substantial relationship to the solar zenith θs." so why not just remove the graphic?

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