

Author's response

Reply to comments by Referee 1 (anonymous)

The authors satisfactorily addressed my main points from the first round of reviews. I believe the article should be suitable now for publication in TC. Before that, however, please consider to take into account my few specific comments below.

Lines 116-121 (reply by authors): I do not see the advantage of testing a 'general purpose' model over a better model which takes into account daily cloudiness. The goal is to understand the impact of different methods to calculate on-glacier temperatures on mass balance modelling. It does not make sense to me to deliberately neglect a different source of uncertainty which could be removed (by taking into account the available daily cloudiness data), since this only dampens the capacity to identify the impact on modeled mass balances of the on-glacier temperature calculation method.

Reliable incoming shortwave radiation measurements are only available at the Mar-gl_2973 site. Therefore, we can only take into account the temporal variability of the cloud cover in our study area. Anyway, as suggested, we included daily cloudiness in our mass balance calculations, computed as detailed in Pellicciotti et al., (2005). No significant changes were obtained in the outcoming statistics, as reported in the following table. Based on these results, we think that the daily cloudiness could be omitted in mass balance calculations.

Mass balance statistics from EISModel applications with four different datasets of air temperature^a

Temperature dataset	Calibration run (summer 2010)			Validation run (summer 2011)		
	ME (m w.e.)	RMSE (m w.e.)	N&S	ME (m w.e.)	RMSE (m w.e.)	N&S
Measured temperature	-0.027 (-0.007)	0.080 (0.058)	0.992 (0.996)	+0.052 (+0.083)	0.156 (0.162)	0.888 (0.879)
Standard lapse rate	-0.049 (-0.059)	0.252 (0.232)	0.918 (0.930)	-0.160 (-0.153)	0.261 (0.255)	0.686 (0.699)
G&B method	-0.006 (-0.018)	0.113 (0.095)	0.984 (0.988)	+0.156 (+0.173)	0.314 (0.316)	0.545 (0.540)
S&M method	-0.049 (-0.047)	0.359 (0.360)	0.832 (0.832)	-0.282 (-0.266)	0.366 (0.355)	0.381 (0.418)

	Calibration run (summer 2011)			Validation run (summer 2010)		
	ME (m w.e.)	RMSE (m w.e.)	N&S	ME (m w.e.)	RMSE (m w.e.)	N&S
Measured temperature	+0.006 (+0.006)	0.152 (0.145)	0.893 (0.904)	-0.095 (-0.111)	0.119 (0.141)	0.982 (0.974)
Standard lapse rate	-0.008 (-0.004)	0.210 (0.209)	0.796 (0.799)	+0.178 (+0.156)	0.346 (0.318)	0.844 (0.869)
G&B method	+0.045 (+0.043)	0.288 (0.282)	0.618 (0.632)	-0.172 (-0.219)	0.226 (0.246)	0.934 (0.921)
S&M method	-0.018 (-0.016)	0.241 (0.244)	0.732 (0.724)	+0.315 (+0.310)	0.522 (0.518)	0.647 (0.651)

^aCalibration in 2010 and validation in 2011 in the upper table, vice versa in the lower table. Statistics including daily cloud cover in mass balance calculations are reported in brackets.

Pellicciotti, F., Brock, B., Strasser, U., Burlando, P., Funk, M., & Corripio, J. (2005). An enhanced temperature-index glacier melt model including the shortwave radiation balance: development and testing for Haut Glacier d'Arolla, Switzerland. *Journal of Glaciology*, 51(175), 573-587.

Line 952: Cite 'Greuel and Böhm, 1998' at the end of the sentence. Have a look also at 'Ayala et al., 2015, JGR', which may provide further explanations.

References:

Ayala, A., Pellicciotti, F., & Shea, J. M. (2015). Modeling 2 m air temperatures over mountain glaciers: Exploring the influence of katabatic cooling and external warming. Journal of Geophysical Research: Atmospheres.

Ok, references have been added and hypotheses by Ayala et al., (2015) have been reported in the text.

Line 958 ('these two weather stations'). Please provide here the names of the stations (Car-gl_3051 and Car-gl_3082).

Ok, done.

Lines 974-988: please use consistently the terms 'steep' and 'shallow' lapse rates, and not 'high' and 'low'.

Ok, modified accordingly.