

Interactive comment on “Meteorological drivers of ablation processes on a cold glacier in the semiarid Andes of Chile” by S. MacDonell et al.

Anonymous Referee #2

Received and published: 2 July 2013

GENERAL COMMENTS:

* Social importance and impossibility of extrapolation:

In line with previous comments, the study is of great interest and has important social impacts as it will influence the opinion regarding the social/environmental importance of the glacier in the high Andes, which are sometimes threatened by mining operations as in the case of Glaciar Guanaco. For that reason, it would be of great importance to highlight (perhaps in the abstract) the fact that this result is not extrapolable to the whole glacier as they are likely to be representative of a zone within the glacier with the lesser contribution to glacier water runoff. Would be interesting also to discuss more about the possible effects of penitentes in the sublimation/melt regime.

C909

* Subsurface model (p.1840, L.8-11; Fig. 7; p.1844, L. 2-6; p.1851, L.16-17; p.1851, L.23-24): One of the main weaknesses of the article is the weak explanation of the subsurface model and how it is constrained in the lower boundary. Is there direct temperature measurements at depth? Is the glacier depth known at the AWS site? Is geothermal heat flux used in the model? Is shown how quick temperature changes happen up to 1 m deep into the ice. These changes seem to me a bit too fast for heat conduction (perhaps I'm wrong). It is also discussed the penetration of radiation into the ice. It would be interesting to know how the model handles that, and how incoming radiation energy is partitioned at different depths.

PARTICULAR COMMENTS:

p.1839, L.8: “QP is ignored because all of the precipitation falls as snow”, even snows carry heat and could alter considerably surface temperature. Is not clear to me that this sentence validates to ignore QP.

p.1838, L.17-18: “Outgoing longwave radiation is used to calculate surface temperature using the Stefan-Boltzmann law, assuming surface emissivity of 1”, as stated afterwards the model is very sensitive to changes in surface temperature. Constant emissivity equals to one doesn't make much sense as albedo changes significantly and usually albedo and emissivity are linked. A stronger rationale should be presented to support this constant value choice for emissivity.

p.1841, L. 5-7: “so it is possible that some wind scouring diminishes the snowpack immediately following deposition”, would be interesting to point out the possible effects of penitentes in this matter in the lower reaches of the glacier.

p.1841, L. 14-16: “As most ablation events following snowfalls are relatively well reproduced, there is no evidence of significant losses caused by wind erosion of the snowpack”, Given the high winds reported and low temperatures it would be interesting to see how the authors can contrast this with in situ observation of wind driven snow redistribution. Also would be necessary to quantify “significant”. i.e.: “ablation events

C910

following snowfalls are well reproduced within xxx mm.w.e. , therefore constraining the possible magnitude of wind erosion of the snow pack....”

p.1850, L. 16-17: “measured by an effective cloud cover index”, it deserve more attention the fact that all your correlations and discussion relating cloud cover are based on a indirect measurement (as I understand you have no direct cloud cover measurement), and how this can affect the results/conclusions and in areas with such a rough topography, clouds can be very localized and persistent in any some specific portions of the sky. So assumptions in cloud cover homogeneity might be wrong.

Interactive comment on The Cryosphere Discuss., 7, 1833, 2013.