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The Cryosphere Discussions

Interactive comment on "Surface motion of active rock glaciers in the Sierra Nevada, California, USA: inventory and a case study using InSAR" *by* Lin Liu et al.

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In general the paper is an interesting and sound work that I recommend to publish after some careful modifications.

In general, the geophysical/geomorphologic interpretations are not always sound or lack evidence. I recommend to either strengthen the related analyses and evidence, or tone them done.

***** SUBSTANTIAL COMMENTS *****

page 344/line 11: the surface flow is influenced by surface geomorphological features?

How do you know that it is not the other way round? I don't find such evidence from your data. Perhaps just say the both are correlated, or so.

349/16: date of DEM? Potential influence of elevation changes between DEM date and PALSAR acquisitions?

352/16, 352/4: no correlation between speed and elevation or size. This contradicts 353/4, where you state that elevation is responsible for the regional speed differences. Further, to what extend could your simplified incidence angle and slope be responsible for diluting a potential correlation? In any case, you NEED to provide an estimate on the potential impact of this simplification in incidence and slope angles. And you should explain why you used the simplification. If I am not wrong, the computation of pixel-wise correct incidence angles and slopes should not be very complicated.

352/20: such comparison to other speeds is not very conclusive. See Fig 3 in Kääb et al. 2007 (in your ref. list). If, you might want to relate it to some MAAT for your region and average rock glacier height, or so.

353/3, 359/1: is the regional difference between 57 and 39 cm/yr statistically significant??? Could it also be due to your simplification of incidence and slope angles? What if rockglaciers in the different parts have actually different average slopes, or have different average ground ranges?

354/26, and later: your 3 months delay is reasonable, but if I am looking at Fig 5 it could also be only 1 months taking into account the error bars. Give some, at least rough, error estimate/consideration for the delay. On the other hand, your 3-months estimate is similar to the one found by Kääb et al. (2007) (their Fig. 6).

355/9 and further: I agree with the strengths of InSAR, but you should mention somewhere that airphotos have also been used for regional rock glacier speed inventories, with some advantages (besides the mentioned disadvantages) to InSAR, e.g. are they in principle spatially more complete (no layover etc.) and provide 2-D velocities. E.g

Roer I., Kääb A. and Dikau R. (2005): Rockglacier acceleration in the Turtmann valley (Swiss Alps): Probable controls Norwegian Journal of Geography. 59, 157–163. Roer I., Kääb A. and Dikau R. (2005): Rockglacier kinematics derived from small-scale aerial photography and digital airborne pushbroom imagery Zeitschrift für Geomorphology N.F. 49(1), 73-87.

356/26: Kääb et al. (2007) themselves found a similar discrepancy between purely thermal diffusion-based speed variations, and observed ones, and suggest melt water penetration as reason. See also 357/1-16.

357/1-16: a bit weak and unclear. Perhaps tone down. E.g. ice melt at depth? How should that work? Do you mean basal melt from lateral water influx? Or warming of ice due to penetrating melt water?

- It would be good to see more examples like Fig 3(a), i.e. interferometric displacements, to give the reader a better feeling about the kind and quality of results you build upon. Perhaps in the Suppl. But also the main article could easily contain 1-2 such figures more. (sorry, if such figures are present in the Suppl. and I didn't find them). You could also include them in the .kmz.

***** DETAILS *****

page 344/line 6: ... at speeds THAT range ... (?)

344/18: ... changes of rock glacier KINEMATICS in a warming ...

353/9: also solid material (i.e. debris) supply could be important, itself depending on among others geology and topography.

356/4: annuAl

END OF REVIEW

Interactive comment on The Cryosphere Discuss., 7, 343, 2013.