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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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I found this paper very well written and agreeable to read. It is presenting a sounded approach to prepare an inventory of moving rock glaciers in the Sierra Nevada of California. My attention in the review was directed towards the InSAR technical part and I did not found any point requiring more than a minor technical correction.

Here the list of suggestions.

It is worth mentioning at the beginning of page 346 that rock glaciers are optimum targets for InSAR, as there is no vegetation cover.

For the discussion at the end of page 346, please be aware that at least for the European Alps there are GPS measurements over long time periods, see e.g. https://edit.ethz.ch/ggl.baug/publicationsEmbedded_cs/printDetail?id=116509&language=DE.

It is mentioned many times that a "significant seasonal variation of surface speed" was observed, but this is verified only over a single season. The sentence should be therefore smoothed a little bit, even of the peak of velocity in the fall is in line with measurements in the Alps (see reference before).

Regarding the discussion at the middle of page 346, how can you be sure that every signal of movement correspond to a rock glacier and not to another moving landform?

p.350, l.17. Because the tropospheric artifacts are "assumed" to be uniform within this small area.

The discussion about the effect of dry snow cover at page 355 deserves more attention. It is correct to say that L-band radar waves can easily penetrate through thin and dry snow, but, as explained by Guneriussen et al. (Tore Guneriussen, Kjell Arild Høgda, Harald Johnsen, and Inge Lauknes. InSAR for estimation of changes in snow water equivalent of dry snow. IEEE T. Geoscience and Remote Sensing 39(10):2101-2108, 2001) this has an effect on the interferometric phase. Specifically, for incidence angles theta < 60 degrees, the phase shift due to dry snow can be expressed by: phase_shift(snow) = 1.6 / cos (theta) * 2PI / lamda * SWE, where lamda is the wavelength and SWE the Snow Water Equivalent, i.e. the integral of snow density * depth. At L-band, 12 cm of SWE would correspond to a phase shift of 2PI, for a snow density of 200 kg/m3 this corresponds to a snow depth of 60 cm. Some information about the snow cover distribution over Sierra Nevada should be given. Of course, if the snow cover distribution over the relatively small size of a rock glacier is constant, no phase shift is observed.

Please indicate flight and LOS directions on Figure 4.

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