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# *Interactive comment on* "Tracing glacier changes since the 1960s on the south slope of Mt. Everest (central Southern Himalaya) using optical satellite imagery" *by* S. Thakuri et al.

**Anonymous Referee #2**

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Review of Tracing glacier changes since the 1960s on the south slope of Mt. Everest (central Southern Himalaya) using optical satellite imagery by Thakuri et al.

General comments

In this paper, authors addressed to evaluate temporal change of glacier area(whole and debris-covered part) and SLA by remotely sensing data and historical maps. This kind of study using many kind of multi-temporal data setis valuable for evaluating glacier variation in long time period. However, the result has not yet reach publishing quality.

As authors noted in manuscript, the evaluation of glacier variation through area/length



change has shortage due to delayed responce to climate change. Hence, you need to explain the reason why you evaluate glacier variation through area/length change.

I also have same question with Mölg that the unit of area shrinkage rate is not appropreate. Absolute value shoud be used.

Authors mentioned recent increase of debris-covered part. However it might be caused by decrease of debris-free part. I recommend to include distribution map of glacier (with boundary of debris-covered/-free part) in each year.

Specific comments

5390-13: Are The SLA upward velocity numbers (2.2 and 6.1) calculated from Table 2?

5390-18: Please include specific number of upward shifts.

5390-20: To assert this, you also need to evaluate other region using same method.

5395-19: How much is root mean square error of GCPs?

5400-17: I recommend to perform detail investigation of each glacier about acceleration. The number of glacier (29) is not so much, hence, evaluation of acceleration of individual glacier would be better than statistical test of all glaciers.

5400-28: It is interesting that why TISmap-63 overestimates $\Delta$Term. Is there any characteristics about the distribution of overestimated glacier?

5403-13: Does it really mean increase of debris-covered area? Discussion based on area ratio is confusing. It might be caused by decrease of debris-free area (same with general comment).

5404-17: In comparison of selected 10 glaciers among previous (Bolch et al., Nuimura et al., ) and your study, individual comparison of all 10 glaicers would be better than bulk comparison.

5405-1: Glacier surface shrinkage and mass-balance change would have time lag due to responce time. This assertion that "can be considered suitable indicators ..." is difficult from your result.

5412-26: How did you evaluate this relationship size/aspect? And you also make figure about the relation. The relationship size/mean glacier elevation too.

Please show me 1 or 2 sample image of separation of Lateral/frontal morain and debris-covered glacier.

Table 1: You considered KHmap-50s as glacier map in late 1950s. However, the map originated from photographic survey in 1921, terrestrial photogrammetric survey in 1935 and 1939. Why you did not consider the map date as 1920–30s but 1950s ? If there is reasonable reason, please include the explanation in the manuscript.

Figure 4: Figure about variation of individual glaicer among the studies would be better for evaluating relation between glacier size and variation. Visuallization of the figure might be difficule due to much informatiion, hence, ploting figures by grouping glaciers depend on size might be better (ex. Figure 4a: <2.5, Figure 4b: 2.5-10, Figure 4c: >10).



Technical corrections

5403-18: Is Fig. 3a2 mistake of 3d2 ?

Interactive comment on The Cryosphere Discuss., 7, 5389, 2013.