

# ***Interactive comment on “Characteristics of an avalanche-feeding and partially debris-covered glacier and its response to atmospheric warming in Mt. Tomor, Tian Shan, China” by Puyu Wang et al.***

## **Anonymous Referee #1**

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This paper presents observation results of a glacier partially covered by debris in the central Tian Shan. The observations include the glacier changes in terminus, area, thickness, mass balance, debris-cover, ice velocity and temperature. Although some observations are short, it is very value of understanding this type glacier response to climate change. After describing all field works and characteristics of this glacier, the paper gives a comprehensive analysis and discussion on glacier change process and its influence factors such as climate, debris cover and geomorphology. Generally it is a thorough work and both data and results are suitable and worthwhile for publication. Therefore, I support publication of this paper in TC after some revisions.

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To my understanding, the following comments need consideration of the authors for revision:

1. English language throughout the paper must be improved. The language is a common problem to Chinese people and to me also. So I strongly suggest the authors give attention more on this. 2. Debris cover is a very important factor influencing the glacier melting. It is mentioned in the paper that with the melting enhancing, the proportion of the debris-covered area and thickness increased as well as inhibition of debris cover to melting. Because the authors have large scale maps surveyed in 1964 and 2008, it is possible to check if the debris cover expanded from comparison of these maps. If it is true, the conclusion becomes more believable. 3. According to higher surface velocity compared to other glaciers in Tian Shan and to that the temperature at 10m depth is quite near the melting point, the authors say that the glacier is analogous to a temperate or a monsoon maritime glacier. I think it should be cautious since this region is in far inland under the continental climate. For a temperate glacier, ice velocity is almost attributed to the basal sliding. In this paper, proportion of sliding velocity has no given. Perhaps the basal sliding exists but not everywhere in the ablation area. 4. The ice thickness data is very good because GPR measurement sections covered the ablation area very well. However, the presented transverse section (Fig.3c) is not clear to show the valley shape. If the basal sliding is strong, the glacier valley should be U shape and can be seen clearly from the sounding profiles. So I suggest the authors give more clear thickness profiles. 5. As mentioned in the section 3.1, snow pits at 4400 and 4600 were observed despite of the fragile surface and frequent snow/ice avalanches. But the result of these snow-pits was not presented. Since no any other data has been obtained in the accumulation area, this snow-pit observation is very important for estimates of the accumulation rate.

Other minor points: 1. Please check references cited correctly. 2. In Fig.1a, a thick black line in the upper seems to be the country boundary. And there are two black patches, seemingly lakes. They should be marked clearly. 3. Since most valley glaciers

in the Tomor region have debris cover on their surface to different extents and the debris-covered area accounts for a half of the ablation area, to say “debris-covered” may be better in my opinion. 4. In the paper, “debris cover”, “debris-cover”, “debris covered area” and “debris-covered area” occurred at different places. Please check these.

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