

Interactive comment on “Rapid glacial retreat on the Kamchatka Peninsula during the early 21st Century” by Colleen M. Lynch et al.

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According to Figure 2 of the proposed paper, both semi-automatic methods are not suitable (or incorrectly used) for identification of glaciers in the zones of modern volcanic activity, the major part of which is covered with a ground moraine. This person, who manually interpreted the images, has determined not the glacial boundary, but the boundary of surface of open firn and ice. The scheme 1 (see the attached pdf) shows results from determination of glacial boundaries on Tolbachik Volcano based on space images ASTER 19.07.2012, GeoEye-1 01.09.2011 and GeoEye-1 04.07.2013. Data from field observations was used for determination (GPS points and tracks, photos). In order to demonstrate how data of interpretation fit the real setting the images below show glaciers (mainly their terminus) and observation sites. Fine scale diagram in Figure 1 of the paper does not allow adequate assessment of quality of determined

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glacial boundary of the volcanic massif with Klyuchevskoy, Kamen, Plosky Blizhny and Plosky Dalny volcanoes as well as Sheveluch Volcano. The authors suppose that the contour shape of the zones occupied by the glaciers in 2000 is enough for conclusion similar to that in paragraph 1 where the authors have determined not the glacial boundary, but the boundary of the surface of open ice and firn. From that follows the conclusion – in this paper, the glaciation area of active Kamchatka volcanism by 2000 is more than twice understated. There is good reason to believe that the situation with the 2014 satellite images interpretation is not better. Ice and firn area size variations on satellite images are caused by many factors, e.g. accumulated seasonal snowfalls, atmospheric temperature during the summer, summer snow flurries etc. It is impossible to determine both the boundary and area of glaciers in general using these area size variations of glacial parts, which are not covered with moraines. The article does not contain the shooting dates for used satellite images. The dates of shooting are important for understanding how the setting of survey corresponds to that in-situ by the end of the ablation period, i.e. the understanding of how the remaining seasonal snow cover and the snow beds could corrupt the results of glacial boundaries determination (especially in the accumulation area). Probably, the errors caused by the remaining seasonal snow cover and the snow beds are the reason for big difference of glaciers areas (as in Figure 4) and their amount between the 2000 and the 2014 images measurements. In comparison with the data of other authors the amount of glaciers found in Kamchatka by authors is underestimated. The authors incorrectly determine the boundaries of the glaciers due to insufficient knowledge of the investigated glaciation area specific features, the lack of the accuracy of the used satellite images and the use of determination methods not valid for glaciers with high debris cover (or misuse of quite valid methods). During the investigation the authors reveal significant reduction of the glaciers area and the increase in their amount from 2000 to 2014, probably explaining by measurement errors resulted from the following factors: the presence of the remaining seasonal snow cover and snow patches at the time of shooting; the lack of the accuracy of the used satellite images Landsat and

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ASTER for small ($<0.5 \text{ km}^2$) glaciers; incorrect methods of determinations used by the authors. This study does not reflect the changes in glaciation of Kamchatka from 2000 to 2014. The results are based on invalid data.

Please also note the supplement to this comment:

<http://www.the-cryosphere-discuss.net/tc-2016-42/tc-2016-42-SC1-supplement.pdf>

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-42, 2016.