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Interactive comment on "The GAMDAM Glacier Inventory: a quality controlled inventory of Asian glaciers" *by* T. Nuimura et al.

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General comments on The GAMDAM Glacier Inventory: a quality controlled inventory of Asian glaciers by T. Nuimura, A. Sakai, K. Taniguchi, H. Nagai, D. Lamsal, S. Tsutaki, A. Kozawa, Y. Hoshina, S. Takenaka, S. Omiya, K. Tsunematsu, P. Tshering and K. Fujita

Samjwal Bajracharya, July 2014

This paper presents a complete picture of Asian glaciers in 1999–2003 based on the Landsat imagery and the SRTM DEM. This is a huge amount of work undertook by Nuimura and his team. The glaciers outlines were digitized manually from the single source of Landsat satellite images with short temporal range which was lacking in the

previous published documents.

The author compared the (GAMDAM Glacier Inventory) GGI with two other glacier inventories, the Randolph Glacier Inventory (RGI) version 3.2 (Arendt et al., 2012; Pfeffer et al., 2014) and a glacier inventory derived from high-resolution (2.5 m) Advanced Land Observing Satellite imagery (AGI) from the Bhutan Himalaya. The results were also compared with the data of Bajracharya and Shrestha (2011) and Bolch et al. (2012).

The GGI derived number and area of glaciers are highly consistent with AGI (101% in number and 99% in area), but slightly under estimation than RGI, Bajracharya and Shrestha (2011) and Bolch et al. (2012). The RGI is a global inventory, and in fact the Chinese Glacier Inventory for China and ICIMOD's glacier inventory for Nepal, which are actually the results derived from the topographic maps from ∼1956 to ∼1983, with the median at about 1970. Hence the number and area of RGI are greater than the AGI and GGI. The results of Bajracharya and Shrestha (2011) and Bolch et al. (2012) are mostly based on the Landsat satellite images of 2005±3 years with the complements of RGI particularly in the Chinese territory.

In the GGI, glaciers smaller than 0.05 km2 were excluded while in the second generation glacier inventory of China and ICIMOD's inventories excluded only the glaciers smaller than 0.02 km2.

In the context of availability of advanced tools and technologies in remote sensing for glacier mapping and monitoring, the manual digitization is time consuming, hectic and tedious work particularly for the bigger region. The study of Paul et al. 2013 shows the differences of the automatically derived outlines from a reference value are as small as the standard deviation of the manual digitization from several analysts. Based on these results, they concluded that the automated mapping of clean ice is preferable to manual digitization and recommend using the latter method only for required corrections of incorrectly mapped glacier parts (e.g. debris cover, shadow). Almost 90% of the glaciers in the HKH region are clean-ice glaciers (Bajracharya and Shrestha, 2011).

Besides the mapping of glaciers by several professionals for accuracy if the output of the mapping has finalized by one expert it will be far better.

This paper provide up to date information of Asian glaciers. I would be happy to see it published in The Cryosphere.

Some comments P2800 and in other area Instead of "glacier in the high mountain Asia" "Asian glaciers" sounds better P2801 L15 “Pfeffer”.

L22 Why not give the exact extension of glaciers. The glaciers below 27.5 deg latitude does not exist in Asia. (Bajracharya and Shrestha, 2011)

P2804 L26-28 Though 11 operators had delineated the glacier outline in 20 months with review of initial delineation but the error will be minimized if peer reviewed by limited number of reviewers.

P2815 Table 1 show very high glacier number and area compared to the report Bajracharya et al. 2014. The number and area shows not only the glaciers within the territory of Bhutan but also included from the adjoining areas. The inventory of glaciers in Bhutan in 2010 shows 885 glaciers with total area of about 642 km2. (Bajracharya et al. 2014)

Table 2 difference (%) subtract from 100 and provide the difference in + and - %

Reference

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2. Paul, F; Barrand, NE; Baumann, S; Berthier, E; Bolch,T; Casey, K; Frey, H; Joshi, SP; Konovalov, V; Bris, RLE;. Molg, N; Nosenko, G; Nuth, C; Pope, A; Racoviteanu, A; Rastner, P; Raup, B; Scharrer, K; Steffen, S; Winsvold, S 2013: On the accuracy

of glacier outlines derived from remote-sensing data. Annals of Glaciology 54(63); 171-182. doi: 10.3189/2013AoG63A296.

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