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Mass balance of Potanin glacier, Mongolian Altai

Keiko Konya (1), Tsutomu Kadota (2), Fumio Nakazawa (3), Hironori Yabuki (2), Gombo Davaa (4), Khalzan Purevdagva (4), and Tetsuo Ohata (2)

(1) JAMSTEC, RIGC, Yokosuka, Japan (conya@jamstec.go.jp), (2) JAMSTEC, RIGC, Yokosuka, Japan, (3) NIPR, Tokuo, Japan, (4) IMH, Ulaanbaatar, Mongolia

1. Introduction
Fluctuation of glacier mass balance can be an indicator of climate change. In order to understand global climate change, it is necessary to extend the observation network of the mass balance of as many as glaciers in the world. However, long-term monitoring records are biased forwards logistically and morphologically “easy” glaciers (IPCC, 2007). As for Asian regions, mass balance research is not sufficiently done. There are many glaciers in the Tavan Bogd mountain area, western Mongolia. It has been reported that Potanin glacier is shrinking (Kadota and Davaa, 2007). It is reported that Potanin glacier in western Mongolia is retreating for last some decades. The terminus retreat of Potanin glacier was estimated as 866m by Aster image (Yabuki et al., in preparation). Mass balance was estimated for Potanin glacier where direct mass balance observation has not been done before.

2. Study site
Altai mountain range extends in Mongolia, China, Kazakhstan and Russia. Potanin glacier (49º09’N[U+FF0C]87º55’E) is situated in the Tavan Bogd region which is in the Mongolian Altai. Potanin glacier flows from the top of the valley next to Mt. Huiten which is highest mountain of 4374m in Mongolia. Potanin glacier is 10.44 km in length, 2 km in width and ranges from 4373 to 2900 m a.s.l. and the area was 24.34 km2 in 2003. Precipitation is remarkably large and summer (JJA) mean temperature is positive,

3. Method and Result
3.1. Stake measurement in ablation area
Stakes measurements are done in June and September in 2004, 2005, 2007 and 2008 to know summer and winter balance. The stakes were set with about 100 m elevation interval beginning from 2,900 m a.s.l. with 3 stakes on the same altitude (Konya et al., 2010). The surface height change was continuously measured with an ultrasonic distance sensor on the AWS.

3.2. Pit observation and Pollen analysis in accumulation area
For accumulation area, pit observation was done at two sites in September 2008. Each site is at the altitude of 3752 m and 3890 m. Both are near the upper end of accumulation area. Net balance was estimated with pollen analysis from pit samples. Pollen analysis was done based on Nakazawa et al. (2004) which is proven in Sofiyskiy glacier (49º47’N, 87º43’E) in Russian Altai. Betulaceae, Pinus and Artemisia are used as indicator. Also, snow density measurement and snow sampling were done every 5 cm layers. Summer accumulation was observed in the pit. And the snow depostion in the accumulation area was so large which is due to orographic effect.

3.3. Mass balance
These observations revealed that ablation rate in summer is large in ablation area and shortwave radiation is dominant heat source for surface melt. Accumulation basically occurred in winter. However, snow pit observation in accumulation area shows that it occurs also in summer. The specific mass balance was estimated from those data. Mass balance of Potanin glacier in the mass balance year of 2007/08 was estimated to -1.03 m w.e. which is extensive negative mass balance compared to Maliy Aktru glacier in Russian Altai. Also, mass balance of the glacier in 2004/2005 was estimated to -0.58 m w.e. using the same method.

4. Discussion
Mass balance of glaciers in Mongolian and Russian Altai show different tendency, both of them show decreasing tendency. The difference is due to topography and ELA as well as climate of the region. It is probable that precipitation as snow or rain had an influence on mass balance. Mass balance of glaciers in Altai may continue decreasing in future.