

Surface mass balance in Suntar Khayata Range of North-Eastern Siberia

Yong Zhang¹, Hiroyuki Enomoto¹, Tetsuo Ohata¹, Nozomu Takeuchi²

¹ *Arctic Environment Research Center, National Institute of Polar Research*

² *Department of Earth Sciences, Graduate School of Science, Chiba University*

Glacier mass balance forms a vital link between climate change and glacier dynamics and hydrology, and its variation is the best way to infer climate change from glaciers. The Suntar Khayata Range are located in the north-eastern Siberia, which contains 176 glaciers covering an area of 152 km². In spite of the recent observed glacier changes in the Suntar Khayata and the reported climatic trends, no study has attempted to reconstruct variation in the surface mass balances in the region. Therefore, we reconstruct the surface mass balance of the No. 31 Glacier over 1950-2012, on which meteorological and glacio-observations exist during different periods. According to our calculations, the glacier shows a mean annual balance of -0.48 m water equivalent per year over the period 1950-2012, with a large interannual variability. In particular, glacier mass loss has been accelerated since the 1990s. Besides rising temperature, decreased precipitation is probably driving such significant mass loss. In addition, the glacier is characterized by the surface impurities, which comprise mineral particles, cryoconite granules and ice algal cells filled with dark-reddish pigments. To comprehensive assess the influence of the surface impurities on the glacier mass change, we recalculate the surface mass balance with an assumption of no impurity on the glacier. The result indicates that the presence of the surface impurities strongly enhances the glacier mass loss compared with the no-impurity assumption case.

References

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