

Mass balance of Gregoriev Glacier, Kyrgyz Tianshan Mts. derived from differential GPS surveys and energy-balance model

Koji Fujita^{1*}, Nozomu Takeuchi², Stanislav A Nikitin³, Arzhan B Surazakov⁴, Sachiko Okamoto¹, Vladimir B. Aizen⁴, Jumpei Kubota⁵

¹Nagoya University, ²Chiba University, ³Tomsk State University, ⁴University of Idaho, ⁵RIHN

In order to assess ice-drilling site on Gregoriev Glacier, Kyrgyz Tianshan Mts., we conducted differential GPS (DGPS) surveys and meteorological observation for the period 2005-2007. Vertical movement of stakes surveyed by DGPS for two years and surface snow densities surveyed by pit observations for three years suggest that the glacier will be in steady state with net accumulation of 253 mm water equivalent (w.e.). Changes in surface level reproduced by an energy-mass balance model are consistent with recorded ones at the top of glacier when a reduction of surface albedo with a dust event is taken into account. DGPS surveys also provide an altitudinal profile of changes in surface elevation between 2006 and 2007 and the profile were compared with another profile derived from the energy-balance model. We conduct mass balance reconstruction by the energy-balance model with a re-analysis data set since 1979 and thus show that: 1) the top of the glacier has been affected by melt, 2) but all melt water should be refrozen (no discharge), 3) equilibrium line altitude has still within the glacier range, and 4) by taking into account evaporation, annual precipitation and air temperature should be 296 mm and -12.2 degC to keep the shape of glacier stable.

Keywords: glacier, mass balance, Kyrgyz, Tianshan