

Heat balance analysis for the snow surface in the Norikura highland

*Motoshi Nishimura¹, Keisuke Suzuki¹

1.Department of Environmental Sciences, Faculty of Science, Shinshu University

In this study, we calculated the amount of snowmelt and the ablation process of snow cover. The degree-day method, which uses daily mean air temperature, has been generally applied to estimate the snow surface melting. However, it is difficult to estimate its effect in terms of time-dependent spatial snow melting. We installed a meteorological station at a site located 1590 m.a.s.l., in the Norikura highland and carried out a heat balance analysis for the snow surface. We obtained the following meteorological data: air temperature, short wave net radiation, long wave net radiation, relative humidity, precipitation, atmospheric pressure, wind speed, and snow depth. We applied the heat balance method to analyze the heat balance and turbulent heat flux on the snow surface.

During the three snow cover seasons, the mean air temperature in this site is -3.7 C and the maximum snow depth has been about 150-180 cm. The result of the heat balance analysis on this site revealed that the net radiation heat flux comprised the largest proportion of the snowmelt energy, followed by the sensible heat flux (second largest). However, latent heat flux contributed to the large negative melt energy flux. We suggested why net radiation heat flux becomes very large because the wind speed of this site has been recorded about 1.0 m/s during the snow cover period, and then the turbulent heat flux became small amount of heat flux. In addition, the small amount of sensible heat flux was caused by low air temperature.

Keywords: heat balance analysis, snowmelt, Norikura highland