

Surface energy balance property of seasonal snow cover similar to continental climate in the southern Japanese Alps region

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Snow ablation process can be one of the indicator of global climate change. Particularly, seasonal snowcover in temperate Cryosphere and alpine regions are significantly sensitive to the ambient climate and meteorological condition. Therefore, it is vital to investigate how the seasonal snowcover forms and melts in temperate Cryosphere in order to validate the effect of global climate change.

Surface energy balance (SEB) is the most fundamental information to discuss a snow ablation process. SEB is sensitive to regional atmospheric conditions. This presentation offers the result of SEB analysis in the southern Japanese Alps region, Kamikochi (1490 m a.s.l.), Norikura highland (1590 m a.s.l.) and Nishi-Hodaka (2355 m a.s.l.) to reveal the characteristic of SEB of seasonal snowcover in Japanese sub-alpine region. Three automatic weather stations, operated by Shinshu University, were located each area in snow covered period of 2016/17 (Hydrological year). SEB analysis was conducted using surface energy balance method, and an analysis of turbulent heat flux was done using the bulk aerodynamic method. SEB analysis were conducted only snow covered period from October, 2016 to June, 2017. SEB property in southern Japanese Alps region are similar to that in continental climate region. The SEB properties in this study region were that, the major energy source was net shortwave radiation, and negative latent heat flux. Those characteristics were often reported in continental regions and such as an high elevation alpine regions, because the atmospheric condition in those regions are often cold and dry so that incoming turbulent energy flux were restrained. Although Japanese climate has been generally regarded as a maritime climate, SEB properties in southern Japanese Alps region were similar to a continental climate.

The mechanism that SEB property similar to that in continental climate region is formed in southern Japanese Alps region seems to be attributed to a synoptic climate condition and a topographic condition. Air mass acquiring large amount of moisture from the Japan Sea is advected to Japan, however, due to high precipitation and elevation gradient, relatively drier air mass is probably advected in the central Japanese alpine region than Japan Sea coast area. Thus, atmospheric condition in lee side area, that is southern Japanese Alps region, is similar to semi-arid climate. The properties of SEB balance, therefore, revealed in this study are suggested to be formed by a snowfall mechanism of synoptic air mass advection process and topographic factors.

Keywords: surface energy balance, seasonal snow cover, alpine region