

Snow patches of Japanese Alps last until late autumn 2013 and their past variations

ASAHI, Katsuhiko^{1*}

¹Institute of Mountain Science, Shinshu University

Variations in glaciers are visible indicators of climate change, especially in mountain region. In Japan, snow patch can be an alternate indicator since glaciers, long years, were not recognized in the Japanese Alps. One characteristic of the Japanese Alps is their extensive distribution of snow patch last until late autumn. A snow patch inventory for this mountain is urgently required, not only for monitoring snow patch variations but also to evaluate water reservoir in the region. Limited number of studies has attempted to complete snow patch atlas in Japan. As a step in this direction, the author has produced an inventory of snow patch lasts before winter 2013 at the entire area of the Japanese Alps. This study addresses the results of snow patch mapping 2013.

The work of compiling a perennial snow patch inventory for the Japanese Alps initially involved oblique aerial photographs taken from a charter flight throughout the Japanese Alps. These photographs were interpreted using a stereoscope. The photographs were taken on 7th and 10th October 2013. The planimetric outline of each perennial snow patch was manually delimited and drawn on 1:25 000 scale topographical maps and successfully compiled the complete set of snow patch inventory of the Japanese Alps in 2013. Then inventory of 2013 thus compiled reveals 579 snow patches with a total surface area of 3.66 km². The year 2013 distribution was much extensive rather than that of usual years. The lowest snow patch termini appeared at the altitude of 1070 m on Mt. Inu of the northern Japanese Alps and the southernmost was 35° 40' 30.5" at Mt. Kita of the southern Japanese Alps. The largest one was the area of 0.184km² on Mt. Karamatsu of the Northern Japanese Alps. Ca. 80% of them locate east-facing slopes, where leeward side against winter prevailing NW wind. Latitudinal profile of the terminus altitudes of snow patches shows northward gradients. Winter northwesterly blown from the Siberian High, collecting vapor from warm current on the Sea of Japan, bring orographic heavy snowfall to the northern part of the Japanese Alps. Thereafter, peculiar snow patch distribution last before winter is likely to be a ruling by maldistribution of snowfall in winter.

In the same area, the inventory of 1976/77, compiled by the vertical aerial photograph interpretation, counts 264 with the area of 2.48 km². Major distribution concentrated in Mts. Tsurugi and Tateyama, central part of the Northern Japanese Alps. The total area in this mountains were 0.78, 0.77, 0.58, 0.84 km² in 1969, 1977, 2009, and 2013, respectively. Snowfall amount in winter and the snow patch area fluctuate largely year-by-year. However, the area fluctuation limits within a range of 30% the total area.

Keywords: Year 2013, Perennial snow patch, Japanese Alps, Snow patch inventory, Aerial photograph

Effects of forest harvesting on winter microclimate and sediment movements in mountainous area

IMAIZUMI, Fumitoshi^{1*} ; NISHII, Ryoko² ; UENO, Kenichi² ; KUROBE, Kousei³

¹Graduate School of Agriculture, Shizuoka University, ²Faculty of Life and Environmental Sciences, University of Tsukuba, ³Graduate School of Life and Environmental Sciences, University of Tsukuba

Activities of periglacial processes are controlled by the hillslope microclimate (i.e., air and ground temperatures, ground water content) that is highly affected by land cover conditions. Thus, forest harvesting in periglacial areas possibly affects activities of sediment movement (i.e., soil creep, dry ravel) by changing the microclimate of hillslopes. Knowledge on the effect of forest harvesting on sediment movement are needed to protect aquatic ecosystems as well as to develop better mitigation measures for preventing sediment disasters. We also observed difference in the microclimate as well as sediment movement between harvested and non-harvested artificial forests in a periglacial area. The field observation was conducted in Ikawa University Forest, University of Tsukuba, in southern Japanese Alps. In this region, air temperature frequently rises above and falls below 0 degree in winter. Forest harvesting changed both temperature and water condition of hillslopes; diurnal fluctuations in the ground surface temperature in the harvested area (about 15 degree) were much larger than that in the non-harvested area (about 3 degree). In the period without rainfall, water content ratio of soil in the harvested area was lower than that in the non-harvested area. Difference in the freezing and thawing frequency between the harvested and the non-harvested area was also observed by interval cameras. In the period without snow cover, diurnal frost heave was observed almost everyday in the harvested area. In contrast, diurnal frost heave in the non-harvested was observed only several times in one winter. Consequently, forest harvesting changes both microclimate and activities of periglacial processes. Meanwhile, the volume of sediment captured by sediment traps was not clearly different between the harvested and the non-harvested areas. In the harvested area, we found that a large volume of sediment was captured by litters and branches of harvested trees left on the hillslopes. Therefore sediment supply rate from harvested area may be also affected by other factors, such as existence of litters and branches on the ground surface.

Keywords: freeze-thawing, sediment movement, soil creep, frost heave, dry ravel, forest harvesting

Spatial and temporal changes in soil respiration in an old-growth forest on the slope of Mt Hakusan

OHTSUKA, Toshiyuki^{1*} ; SUCHEWABORIPONT, Vilanee¹ ; IIMURA, Yasuo² ; YOSHITAKE, Shinpei¹

¹Gifu University, River basin research center, ²University of Shiga Prefecture, School of Environmental Science

Structure and function of cool-temperate beech forests have been dramatically altered by disturbance. Especially in old-growth forests, canopy disturbance has important influences on the structure and organization of forest communities. As a result, the complexity of forest structure affects the spatial difference in micro-environmental factors such as soil temperature and soil water content. Therefore, the spatial and temporal changes in soil respiration were studied using soda lime in 1-ha study site, and automated open-close chamber using IRGA (AOCC method) in canopy and gap areas in 2013 in an old-growth beech forest, Mt Hakusan. The spatial pattern with the different vegetation and micro-environmental factors showed the high efflux in canopy and the low efflux in gap. All soil effluxes increased from spring (Jun.-Jul.) to summer (Aug.), and then decreased in autumn (Sep.-Nov.). The seasonal pattern showed the hysteresis loop that soil respiration in spring was greater than that at the same temperature in autumn. Diel soil efflux was greatly controlled by soil temperature but a diel lag between soil respiration and soil temperature led to diurnal hysteresis loop in some season.

Keywords: Soil respiration, cool-temperate region, old-growth forests, carbon cycling, beech forests

Spatial distribution of soil microbial characteristics in a cool-temperate deciduous broad-leaved forest in Takayama

YOSHITAKE, Shinpei^{1*} ; YOSHITAKE, Ayako¹ ; IIMURA, Yasuo² ; OHTSUKA, Toshiyuki¹

¹Gifu University, River Basin Research Center, ²The University of Siga Prefecture, School of Environmental Science

1. Introduction

Heterotrophic microorganisms have an important role in nutrients cycling and soil formation through the organic matter decomposition. Therefore, it is important to clarify the spatiotemporal variation in quantitative and qualitative characteristics of soil microbial community and the factor(s) affecting such spatiotemporal variation in considering the matter cycling. Takayama Field Station of Gifu University has studied carbon cycling in a cool-temperate deciduous forest for long term and have clarified that various ecological processes such as soil respiration showed significant spatiotemporal variation. However, the information of soil microbial community is largely limited and especially, the spatial variation of microbial characteristics and factors affecting it still remain unclear. Then, we aimed to describe the spatial distribution of microbial characteristics and clarify the relationships between spatial distribution and environmental factors.

2. Materials and Methods

Our study site was cool-temperate deciduous broad-leaved forest on the northwestern slope of Mt. Norikura, central Japan. The site was dominated by oak (*Quercus crispula*) and birch (*Betula ermanii*, *B. Platyphylla*) and the forest floor is covered with a dense dwarf bamboo (*Sasa senaninsis*) community. A permanent plot of 1 ha was set on a west-facing slope and 100 subplots (each 10 m×10 m) are distributed along five microtopographic type: ridge (30), northern slope (25), valley bottom (19), southern slope (19) and western slope (7) (Fig.1). Litter (L layer) and mineral soil (0-5 cm of A layer) samples were collected from 100 subquadrat on early May 2013. Some soil properties (e.g., water content, pH, NH₄⁺-N, NO₃⁻-N) were determined. Microbial respiration rate from mineral soil sample was determined by open-flow method with infrared gas analyzer in laboratory condition.

3. Results, Discussion and future plan

Average value of microbial respiration rate per gram soil was significantly differed among five topographic types (one-way ANOVA, $P < 0.01$) and that in ridge ($3.6 \pm 0.81 \mu\text{g CO}_2\text{-C g}^{-1} \text{ h}^{-1}$) was significantly higher than that in valley bottom ($2.9 \pm 0.78 \mu\text{g CO}_2\text{-C g}^{-1} \text{ h}^{-1}$) (Tukey-Kramer test, $P < 0.05$). In this poster presentation, the effects of topography on microbial respiration rate will be discussed based on the differences in environmental factors such as soil water content, litter amount, and soil carbon and nitrogen contents. In addition, soil microbial biomass and community structure will be determined for collected mineral soil samples by phospholipid fatty acid (PLFA) analysis in near future and spatial distribution of microbial biomass, community structure, and respiration activity (respiration rate per biomass) will be clarified.

Keywords: a cool-temperate deciduous broad-leaved forest, soil microbial community, microtopography, microbial respiration rate

Global pattern of gene flow in plant species along altitudinal gradients on mountains

HIRAO, Akira^{1*}

¹Sugadaira Montane Research Center, University of Tsukuba

Several studies on mountain plants with wide-altitudinal distributions have found significant genetic differentiation and structuring among populations along altitudinal gradients. In most of the studies, however, the level of genetic differentiation was not highly remarkable. This is somewhat counterintuitive, since one would expect that mountainous species often exhibit heterogeneous environments and phenological differences along altitudinal gradients, which should be forces driving genetic differentiation. Understanding how gene flow corresponds with altitudinal gradients can inform process of the genetic structuring. I reviewed published studies to categorize global patterns of gene flow in mountainous plant species. These outcomes can depend on 1) isolation by distance, 2) mobility within similar altitudes, and 3) mobility among dissimilar altitudes, and imply evolutionary processes of the plant populations on mountains.

Keywords: altitudinal gradients, gene flow, genetic differentiation, plants