

Monitoring of snowmelt in the Japanese alpine zone by using time-lapse cameras

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The vulnerability of alpine ecosystems to climate change, as pointed out by IPCC, and the necessity to conduct monitoring in the alpine zone have been recognized worldwide. The Japanese alpine zone is characterized by extremely heavy snowfall, and snowmelt is a key factor for the growth of alpine vegetation. National Institute for Environmental Studies has, therefore, launched long-term monitoring of snowmelt and ecosystems in the Japanese alpine zone since 2011 by using automated digital time-lapse cameras, and 18 monitoring sites are under operation currently. By comparing the photographs taken at the same time each year, we can determine the time for snow fall and melting and the spatial differences in their speed,

In this study, a new monitoring method by digital cameras was developed in order to detect yearly changes of snow-cover areas at high temporal and spatial resolutions. We used images derived from the cameras that we have installed at mountain lodges in Nagano Prefecture (at elevations around 2350-3100 m) and at around Mt. Rishiri in Hokkaido, and in addition, the live camera images that have already been operated by local governments in Tohoku area and Mt.Fuji. RGB digital numbers were derived from each pixel within the images. The snow-cover and snow-free pixels were automatically classified by statistic discriminate analysis based on the variance of gray-level histograms for each image.

The detected snowmelt dates showed site-specific characteristics and yearly variations.

Keywords: RGB, discriminate analysis method, ortho-rectify