Quantification of vegetation change and evaluation of change habitat in the Taisetsu Mountains using spatial information

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Alpine plant distribution is strongly affected by snow cover conditions. Alpine zone in Japan is particularly heavy snow environment, typical alpine vegetation is classified by snow depth into fellfield plant communities (0 to 30 cm), *Pinus pumila*-dominated communities (30 to 300 cm), and snow meadow and snow bed plant communities (300 cm or more). In the predominance species of alpine plants, *P. pumila* and *Sasa kurilensis* has large biomass. Not only distribution of *P. pumila* is regulated by snow depth but also shoot growth is related to summer temperature and sunshine duration. Also, *S. kurilensis* is distributed relatively early snowmelt habitat in snow meadow. Therefore, increases temperature and accelerate snowmelt timing by climate change effect brings distribution change of *P. pumila* and *Sasa kurilensis* remarkably. Alpine plant species and community types are often distributed as mosaic patterns reflecting microscale heterogeneity of environmental condition (temperature, wind direction, snowmelt timing) and micro topography (slope and directions). Therefore, distribution changes due to the influence of climate change are predicted to have different expansion rate depending on altitude and habitat location.

In the Taisetsu Mountains, northern, Japan, temperature has increased and snowmelt time has advanced during decades years, which induced distribution of *P. pumila* (25 ha at fellfield edge, 50 ha at snow meadow edge) and *S. kurilensis* (50 ha at snow meadow, 550 ha at forest zone to alpine zone) has been expanding by quantification of 1977 and 2009 (2012) aerial photographs. The environmental gradients have various type even in the same mountainous area, and habitat specific distribution changes have also been revealed. On the other hand, we also necessary to find a trend of whole mountains area at change of distribution and to extract the fragile habitat where particularly the expansion remarkable in order to evaluate climate change.

The aim of this study is to quantify distribution change during 40years of *P. pumila* and S, *kurilensis* in the northern and central part of the Taisetsu Mountains (15 km ×25 km; Latitude 43.473 - 43.722, longitude 142.752 - 142.978) using the aerial photograph of 1977 and the high-resolution satellite image of 2017 (WorldView - 2), and evaluate factors that cause differences in distribution variation from altitude and slope. Because tree line of northern and central part of Taisetsu Mountains are about 1400-1700 m, we analyzed over 1400 m or more in this study.

As a result, *P. pumila* and S, *kurilensis* was expanded almost whole Taisetsu Mountains. Altitudinal gradient of expansion variance is more conspicuous in *P. pumila*, and newly established is also quantified. This result indicates that expansion of the distribution of *P. pumila* is remarkably at high altitude, which has been restricted by the low temperature and the late snowmelt time habitat. On the other hand, the slope tendency was showed different tread for each habitat. Therefore, the distribution of *P. pumila* and S, *kurilensis* spread widely depending for each habitat and topographic factors, whereas in the altitudinal gradient was a clear for expand distribution. The expansion of *P. pumila* and S, *kurilensis* in Taisetsu Mountains, suggesting that not only direct vegetation change in alpine ecosystem but also indirectly significant impact such as increased pressure and biomass are given It was done.

