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The effect of the warming experiment on the vegetation in the Japanese alpine-forest-limit vegetation transition zone

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Over the alpine forest limits, the vegetation changes drastically from the arbor zone to the shrub zone when the altitude increases by only 100 m. Ecosystem there is expected to change drastically by small temperature change and therefore is suggested to be one of most sensitive ecosystems to the global warming. We and other collaborators initiated the artificial warming experiment on the alpine forest limit in 2010 and have been monitoring biodiversity and biogeochemical cycle to reveal the impact of global warming and appeasement actions against it. Here we report the effect on the vegetation over two years.

The study site is at 2600 m altitude in the Shinsyu University Nishikoma Station in the central Japanese Alps. The site is on the steep slope (35 degree in average) and covered with shrubs under approximately 4-m tall *Betula platyphylla*, surrounded by *Abies mariesii* zone at the lower end and *Pinus pumila* zone at the upper end. We set ten open top chambers sized 105 x 105 cm width x 210 cm tall. Five of those chambers were covered with transparent panels at four sides during all seasons (all season warming treatment), and the other five were covered with panels during only summer seasons. Quadrrats sized 55 x 55 cm were set in all the chambers, as well as in five control points outside chambers, for vegetation monitoring.

The interim analysis showed that a dominant shurub species *Vaccinium ovalifolium* gained more current-year shoot growth in the warming treatments (all-season and summer-season warming, combined) than the control from 2010 autumn to 2011 autumn, whilst the difference remained small during 2011 - 2012, suggesting the effect of warming fluctuates over years. Survivorship of *Vaccinium ovalifolium* and *Cladothamnus bracteatus* (both dominant shurubs) was higher in the warming treatments from 2010 to 2012. Plant numbers of the four dominant herbs (*Rubus pedatus*, *Cornus canadensis*, *Streptopus streptopoides* and *Solidago virgaurea* subsp. *leiocarpa*) tended to decrease in the warming treatments over 2010 and 2012. These results suggest that shurubs overgrow under global warmig in the alpine forest limit, leading to decay of herbs by shading. Such vegetation change would impact the animal and microbial communities as well as the biogeochemical cycle, that we and collaborators have been monitoring and expect to report in the near future.

Keywords: Global warming, Biodiversity, Community, Ecosystem, Open Top Chamber, JALPS