Transpiration from cedar (*Cryptomeria japonica*) trees under snow cover in a heavy snowfall area, Shonai, Japan.

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Forest in heavy snowfall areas in northeastern Japan are constrained by periods of snow cover in early spring that extend longer than the onset of suitable atmospheric conditions for the start of transpiration and photosynthesis. In this study we measured sap flow in cedar trees (*Cryptomeria japonica*) together with tree growth, snow depth, soil temperature and environmental parameters to determine the timing of the start of transpiration and evaluate the contribution of snowmelt on tree transpiration. The results showed that tree sap flow started by mid March when snow depth was approximately 2.2 m and soil temperature was nearly 0˚C. However, based on the ranges of optimum air temperatures for the start of photosynthesis we estimated that transpiration started by mid-April and tree growth started by the end of April when soil temperature increases sharply as snowmelt is complete and there is no limitation for tree water uptake. Soil moisture increased steadily from the end of March but it increased drastically in April along with the snowmelt rate. Thus, by May, the driest month of the year, soil water, which was originated from previous year rainfall was replaced by snowmelt water and therefore in May contributed to transpiration when tree-ring formation started. Further, $\delta^{18}O$ analysis will be used to determine to what extent snowmelt water was used in wood formation.

Keywords: sap flow, snowmelt, snow cover, soil temperature, transpiration

