

## **Estimation of whole-tree and stand-level methane emissions from the stems of *Alnus japonica* in a cool-temperate forested peatland**

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We measured methane ( $\text{CH}_4$ ) fluxes at the stem surfaces of canopy trees in a forested peatland of northern Japan to estimate: 1) the  $\text{CH}_4$  emission rates from the stems of individual trees and 2) the stem  $\text{CH}_4$  emission rates at the stand level. The study site was located ca. 1 km south of Lake Tofutsu, a brackish lake in eastern Hokkaido. An experimental plot was established in an area dominated by *Alnus japonica* trees. For seven *A. japonica*, the stem  $\text{CH}_4$  fluxes were measured using a static closed-chamber method. Three of the sample trees were used to estimate the whole-tree stem  $\text{CH}_4$  emissions. The  $\text{CH}_4$  flux was measured at six heights (0.15 – 5.15 m above the ground at 1 m intervals) on the stem of each tree, using a scaffold constructed beside the tree. The stand-level stem  $\text{CH}_4$  emissions were estimated from the  $\text{CH}_4$  fluxes measured 0.15 m above the ground; the relationship between stem height and  $\text{CH}_4$  flux and the relationship between diameter at breast height and whole-tree  $\text{CH}_4$  emissions were determined. Stem  $\text{CH}_4$  emission rates were highest at the lowest measurement position on the stem (height 0.15 m), and decreased with stem height for all measurements. Nevertheless, significant  $\text{CH}_4$  emissions were detected 5.15 m above the ground. The relationship between stem height and  $\text{CH}_4$  emissions fit a power function. The estimated  $\text{CH}_4$  emission rate from the stem surface of an individual tree was  $1.91 \pm 1.24$  and  $0.68 \pm 0.18$   $\text{mg tree}^{-1} \text{h}^{-1}$  for late-August and mid-September, respectively. The estimated stem  $\text{CH}_4$  emissions at the stand level varied seasonally, with the highest rate of  $556 \text{ mg ha}^{-1} \text{h}^{-1}$  in September.