# Real-time continuous measurements of methane in a temprate Japanese cypress forest by near-infrared laser spectroscopy

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Increases in atmospheric methane concentrations since pre-industrial times have contributed a radiative forcing of +0.48+-0.05 W $m^{-2}$. Total $CH_4$ emissions can be well determined from observed concentrations and independent estimates of removal rates. Emissions from individual sources of $CH_4$ are not as well quantified as the total emissions but are mostly biogenic and include emissions from wetlands, ruminant animals, rice agriculture and biomass burning, with smaller contributions from industrial sources including fossil fuel emissions. In 2006, based on their incubation experiments, Keppler and co-workers suggested that terrestrial plants emit $CH_4$ under aerobic conditions and they could be a significant $CH_4$ source with the global estimate of 62-236 Tg $CH_4$ $yr^{-1}$. Since then, subsequent studies by other research groups have presented revised upper limit estimates in the range of 60-176 Tg $CH_4$ $yr^{-1}$, based on alternative up-scaling approaches. As the underlying production mechanism is still unknown, any extrapolation to the global scale is highly speculative. Apparently, further investigations relevant to plant emissions argued by Keppler and co-workers are urgently required. In our present study, in-situ continuous measurements of $CH_4$ in a temperate Japanese cypress forest, using a novel laser-based instrument that allows real-time monitoring of $CH_4$ mixing ratios, have been conducted. An automated closed chamber system, which had been used as a powerful tool to evaluate $CO_2$ exchange between the atmosphere and forest, was coupled to the $CH_4$ instrument for measurements of $CH_4$ concentrations in foliage, soil and trunk chambers, thereby fluxes at each chamber were calculated.