

## Emissions of nitrous oxide and methane in temperate forests with different nitrogen status in central Japan

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Nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>) are strong greenhouse gases, which contribute about a fourth to current warming effect globally. Compared with other sources, importance of forest ecosystems has been less quantified. With the increase of anthropogenic N deposition, it is urgent to evaluate the emissions of these gases from N-saturated forests. In general, forest soil has been recognized as a net sink of CH<sub>4</sub> and as a source of N<sub>2</sub>O, but more works are needed because forests differ greatly in N status, which may play an important role in regulating the gas emissions. Soil nitrification, which is a dominant process of N<sub>2</sub>O emission, often increases with the increase in N status. To the contrary, increased inorganic N availability may inhibit the oxidation of CH<sub>4</sub> by soil microbes.

In this study, emission rates of N<sub>2</sub>O and CH<sub>4</sub> were measured monthly in an N-saturated forest (Tamakyuryo, Tokyo; from May-2012 to Jan-2013) and singly in two relatively N-limited forests (in Fukushima and Izu; Aug-2012) in central Japan. The temperature, contents of water and inorganic N in soil were simultaneously determined. In situ net nitrification rate was measured for soil in the forest of FM-Tama. According to the analysis in Aug-2012, the N<sub>2</sub>O emission rate averaged 18.3 mg-N m<sup>-2</sup> h<sup>-1</sup> at Tamakyuryo, which was 4.5 times higher than those of other forests. The CH<sub>4</sub> emission rate averaged 58.7 mg-CH<sub>4</sub> m<sup>-2</sup> h<sup>-1</sup> at Tamakyuryo, which was significantly lower than those of other forests (67.8mg-CH<sub>4</sub> m<sup>-2</sup> h<sup>-1</sup> for the forest in Fukushima and 95.8 mg-CH<sub>4</sub> m<sup>-2</sup> h<sup>-1</sup> for the forest in Izu). Moreover, a positive correlation was found between the rate of N<sub>2</sub>O emission and the net nitrification rate, and the emission rate of N<sub>2</sub>O varied with the soil temperature. Consequently, it can be inferred that nitrification can be a major process of N<sub>2</sub>O production, and N enrichment in forest will obviously stimulate soil N<sub>2</sub>O emission.

Keywords: Nitrous oxide, methane, nitrogen saturation, nitrification, temperate forest