

B-16.7.2 Studies on Methane Oxidation on Japanese Forest Soils (Final Report)

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Abstract To obtain CH₄ flux data of Japanese forest soils, we set 15 experimental sites (7 sites in Kanto District and 8 sites in Hokkaido, northern part of Japan), and measuring the CH₄ flux in a year. The methane uptake rate ranged from 1.5-6.0 mg CH₄m⁻²d⁻¹ in Hokkaido and 0.7-10.7 mg CH₄m⁻²d⁻¹ in Kanto District, respectively. The average of CH₄ uptake rate was 3.3 mg CH₄m⁻²d⁻¹ (S.D.=1.1, n=8) in Hokkaido and 3.9 mg CH₄m⁻²d⁻¹ (S.D.=2.0, n=7) in Kanto District, respectively. The CH₄ uptake rate is larger than the previous reports, obtained in European countries and the United States. Our result suggests that the global CH₄ uptake rate of terrestrial ecosystems may underestimate.

Key Words Methane, Forest Soils, Deciduous Forest, Evergreen Forest

1. Introduction

It is well known that CO₂, CH₄ and N₂O are the most important greenhouse gases. The contribution of each gases are 60 %, 15 % and 5 %, respectively¹⁾. There is few data about the flux measurement on Japanese forest soils, especially with CH₄ and N₂O emissions.

2. Research Objective

To evaluate the CH₄ flux on Japanese forest soils, we need a lot of data on the field. Our object is to increase the flux data of CH₄ uptake rate of Japanese forest soils.

3. Research Method

We set 15 experimental sites in the field, 7 sites were in Kanto District and 8 sites were in Hokkaido, northern part of Japan. CH₄ flux was measured by closed chamber method²⁾ with a cylindrical stainless chamber (40 cm diameter and 15 cm height, which were inserted into the soil to 5cm depth). The gas samples were collected by disposable syringes with three-way cocks. The CH₄ concentration was determined by gas chromatograph (Shimazu GC-14B-FID). The gas flux were calculated by the first-order kinetics equation³⁾ from three sequential data (0 min, 15 min, 30 min for Kanto District and 0 min, 10 min, and 20 min for Hokkaido). The interval of gas sampling were basically one month.

4. Result and Discussion

The CH₄ uptake rate in Hokkaido (Fig. 1) ranged from 1.5 to 6.0 mg CH₄ m⁻² d⁻¹. The average of the fluxes were 3.3 mg CH₄ m⁻² d⁻¹ (S. D. =1.1, n=8). The CH₄ uptake rate in Kanto District (Fig. 2) ranged from 0.7 to 10.7 mg CH₄ m⁻² d⁻¹. The average of the fluxes were 3.9 mg CH₄ m⁻² d⁻¹ (S. D. =2.0, n=7). The CH₄ uptake rate in summer was higher than in winter, suggesting that the CH₄ uptake depends on the temperature. According to these data, it is estimated that the CH₄ uptake rate in Japanese forest soils is from 3 to 4 mg CH₄ m⁻² d⁻¹. It is higher than the data previously obtained in Europe countries and the United States, suggesting that the global estimation of CH₄ uptake rate by terrestrial ecosystems may be underestimated. Also, the CH₄ uptake by forest ecosystems might play an important role for CH₄ balance of Japan.

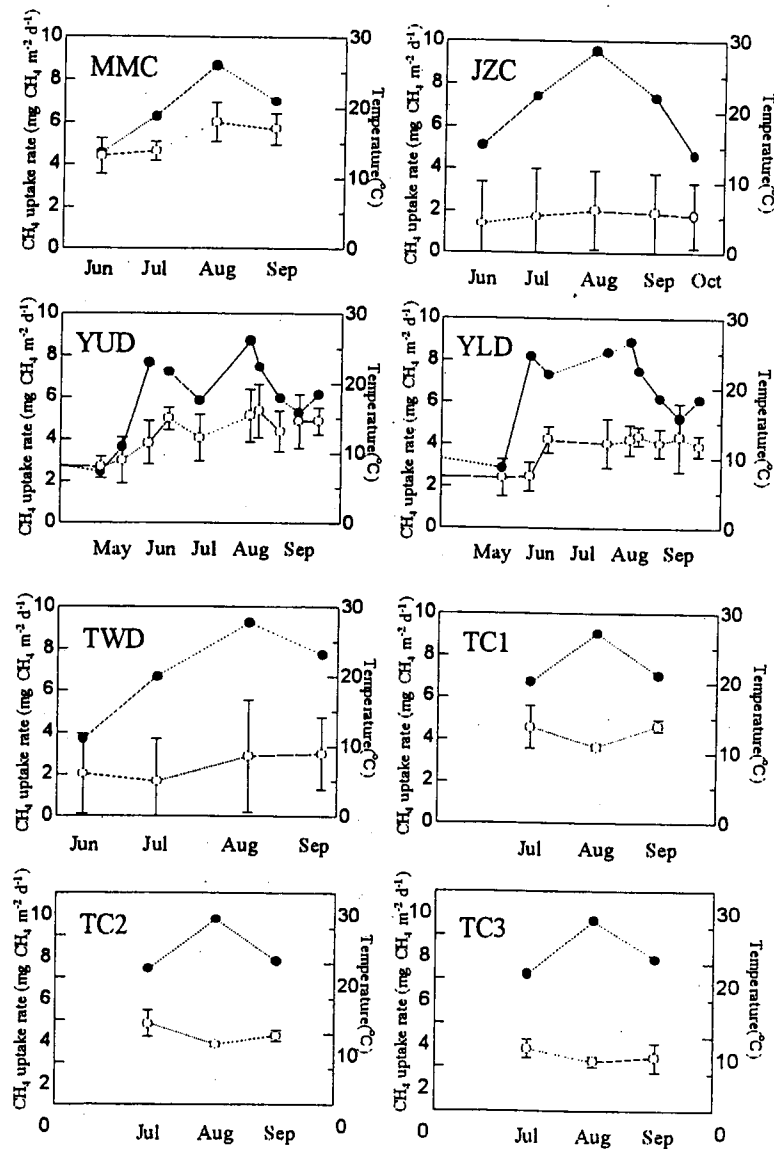


Fig. 1 The fluctuation of CH₄ uptake rate on forest soils in Hokkaido. These data were obtained in 1999. ●, temperature; ○, flux

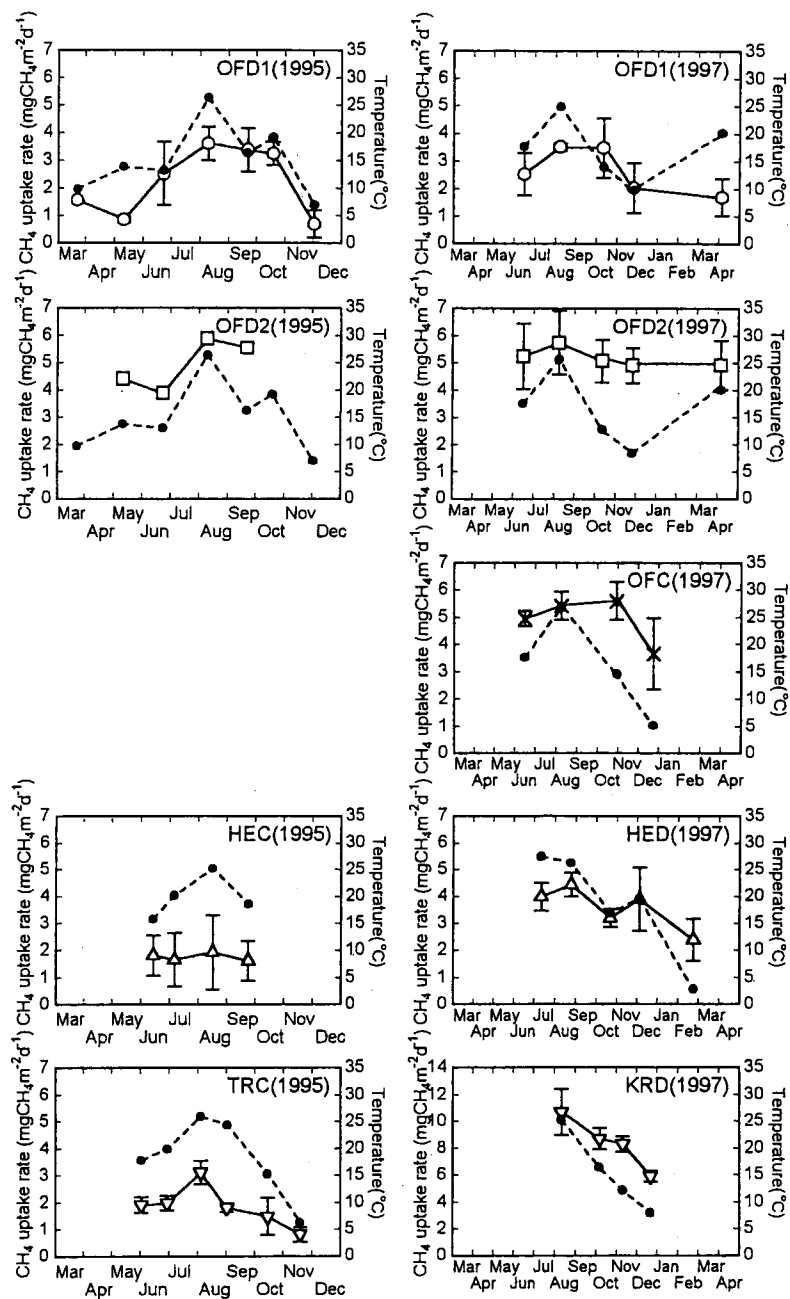


Fig. 2 The fluctuation of CH₄ uptake rate in Kanto District.

●, temperature; open symbols, flux

Reference

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