

Methane emission measurement in a tropical rain forest

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Place of fieldwork: Malaysia

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Research background

Global warming is getting serious all over the world, and terrestrial ecosystems are expected as an important sink for greenhouse gases such as carbon dioxide (CO₂). Tropical rain forests are believed to play an important role in the sequestration of CO₂ and field studies often focus on its quantification. Although methane (CH₄) is the second greenhouse gas characterized by a larger greenhouse effect than CO₂, however, its dynamics in ecosystems have not yet been understood, and we cannot estimate whether a tropical rain forest is its source or sink. Field observational studies regarding CH₄ exchange are strongly needed for the evaluation of this.

Objectives

Recently, it has been found that a plant emits CH₄ in an aerobic condition. Some studies are calculating CH₄ balance in terrestrial ecosystems and suggest that forests may contribute to the emission of CH₄ and that tropical rain forests may be particularly an important source. If these calculations can be accepted, the emission of CH₄ may have an important influence on global warming. In this study, we focus on estimating the emission of CH₄ from plant foliage and a concentration of CH₄ in a forest canopy, and aim at evaluating the exchange of CH₄ between a tropical rain forest and the atmosphere.

Results

Our study was conducted at the Pasoh Forest Reserve in Peninsular Malaysia. The core area (650 ha) of the reserve is a primary lowland mixed dipterocarp forest, consisting of various species of *Shorea* and *Dipterocarpus*. The continuous canopy height was approximately 30 m. Our observation in December 2007 was carried out in a wet season and storms occurred almost everyday. We measured CH₄ emission from each leaf of 9 tree species by an incubation experiment using a chamber and an incubator. As a result, methane production was detected in almost every species. The emission rate was generally larger from leaves at the upper canopy layer than those at the lower. .

Profile measurement for the CH₄ concentration was conducted at heights from 0.2 m to 53 m along our observation tower. Sample air was taken at each of 10 heights for about an hour and a half. The data for three days during our stay suggested that the concentration was not much different in each height and each sampling time, but a slight uptake was shown at the lower portion.



Plate1: Canopy of the study forest.
(A view from the tower top)



Plate2 : Canopy walkway at the height of 30 m.

Our experiment and observation demonstrated a tendency for the emission of CH_4 from the leaves of the forest, particularly at the upper canopy. This suggests that sunlight may be a trigger of CH_4 emission and that plant physiology may control the mechanism. From the result of the profile measurement, however, even if it was emitted with a constant rate, the rate was not enough large and we have not yet obtained clear evidence that our tropical rain forest was a CH_4 source.

Future plan

This was the first trial for measuring CH_4 emission in the Pasoh Forest Reserve. From our current result in a rainy season, it was still unclear whether our tropical rain forest contributed to CH_4 emission or uptake. Further development for the measurement method is also needed for the evaluation. Continuous field study will be necessary in a dry season in particular.



Plate3 : Study tower