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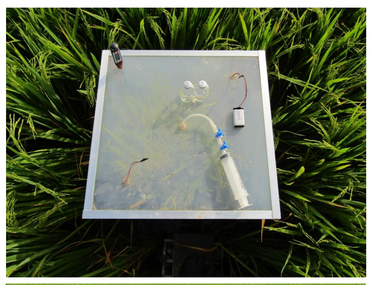
Methane emissions of different Rice Varieties: Diurnal emission patterns of three development stages

Theresa Detering[1], Thi Bach Thuong Vo[1,4], Reiner Wassmann[2], Bjoern Ole Sander[3], Folkard Asch[1]

[1]University of Hohenheim, Germany; [2]Karlsruhe Institute of Technology, Germany; [3]IRRI Vietnam Office, Viet Nam; [4]International Rice Research Institute, Los Banos, Philippines

Introduction

Currently, concentrations of the Greenhouse Gas Methane (CH_4) are rising faster than at any time in the last two decades. To combat climate change, it is essential to quantify and mitigate the main anthropogenic sources of Methane, including rice production. CH_4 emissions from rice paddies exhibit significant diurnal variations, which are often neglected when field measurements are scheduled at a fixed time of a given measuring day. In this study we have recorded CH_4 fluxes at different daytimes by considering varietal differences as well as development stages. The data will allow the selection of low-emitting varieties which, in combination with appropriate water management, represent one of the most promising strategies for reducing Methane emissions. Furthermore, information about diurnal patterns will be used to correct regional emission factors.



Conclusion and Outlook

- All varieties showed distinct diurnal patterns with highest emissions in the early afternoon
- The development stage influenced the characteristics of diurnal emissions
- Daily methane emissions varied strongly between rice varieties – **OM576** showed lowest emissions
- Varietal effects will be verified in further experiments
- Application of correction factor will allow flux measurements at any time of the day

Results and Discussion

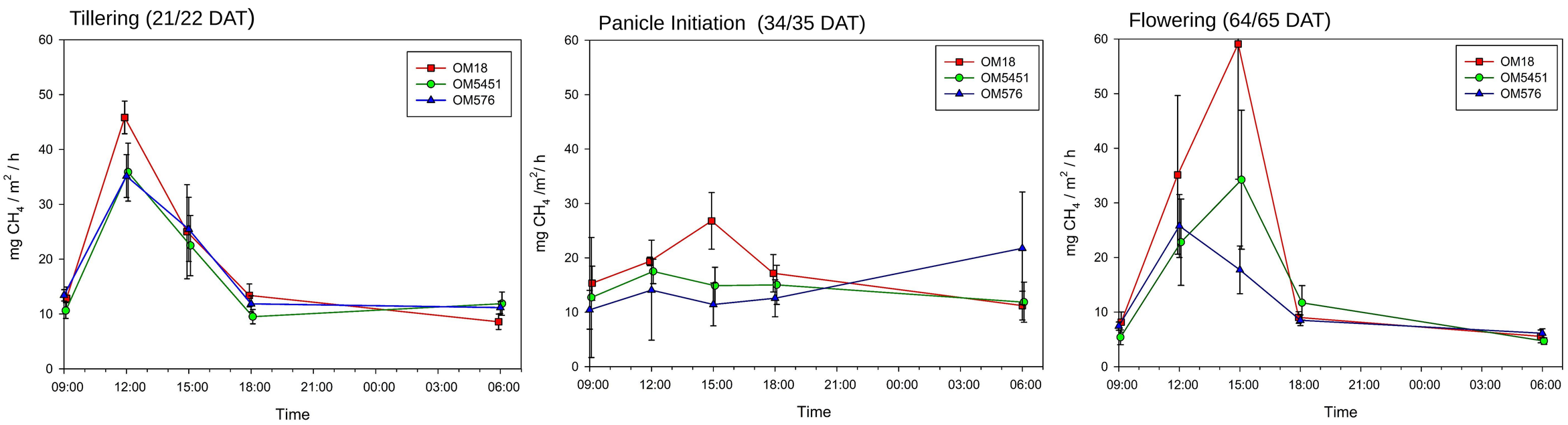


Fig 1: Diurnal Methane fluxes of three different development stages. DAT – Days after transplanting. Error bars indicate standart error.

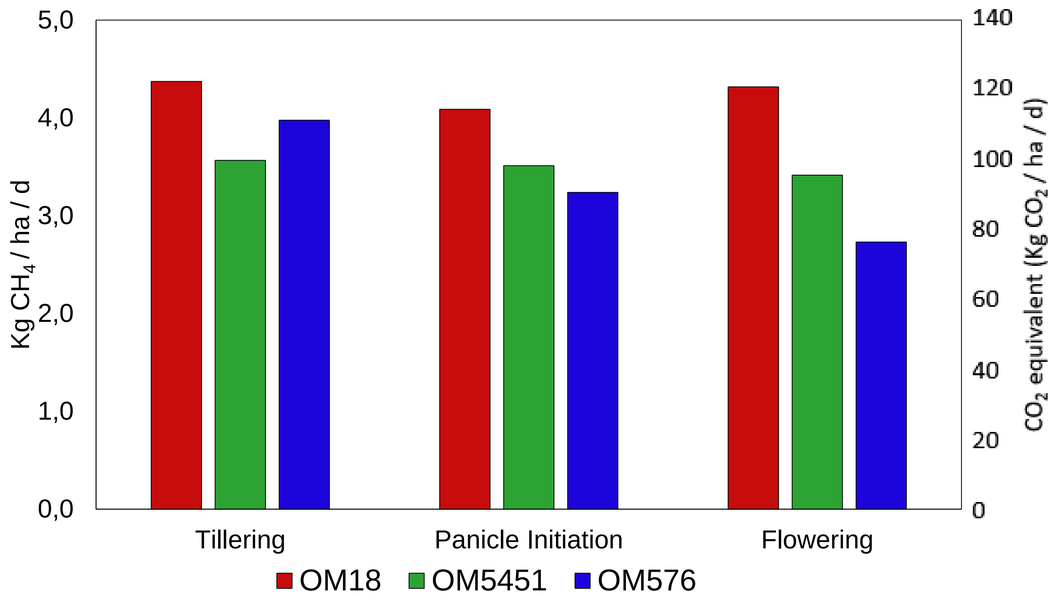


Fig 2: Daily CH_4 fluxes of different development stages

- CH_4 emissons of all diurnal measurements were highest in the early afternoon (12:00 – 15:00)
- Clear diurnal pattern of Methane fluxes were observed at tillering and flowering stage
- At the panicle initiation diurnal variations are less pronounced and emission values are lower
- OM576 exhibited lowest peak emissions at all stages of development as well as daily CH_4 fluxes

Material and Methods

A field experiment was conducted during the dry season 2019/20 in the An Giang province of the Vietnam Mekong River Delta to evaluate the varietal effects of five rice varieties under soil saturated culture on diurnal emissions of methane. Therefore, three diurnal measurements (at tillering, panicle initiation and flowering), each consisting out of five greenhouse gas samplings at 9 am, 12 pm, 3 pm, 6 pm and 6 am at the consecutive day, were implemented. CH_4 samples were collected at 0, 15 and 30 min after chamber closure with a 60-ml syringe using the manual closed chamber method and stored in a 30 ml evacuated glass vial. Analyses were performed with a gas chromatograph at the IRRI laboratory.

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