



Substrate lability and plant activity controls greenhouse gas release from Neotropical peatland

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Almost one third of global CO₂ emissions resulting from land use change and substantial CH₄ emissions originate from tropical peatlands. However, our understanding of the controls of CO₂ and CH₄ release from tropical peatlands are limited. The aim of this study was to investigate the role of peat lability and the activity of the vegetation on gas release using a combination of field and laboratory experiments. We demonstrated that peat lability constrained CH₄ production to the surface peat under anaerobic conditions. The presence of plants shifted the C balance from a C source to a C sink with respect to CO₂ while the activity of the root system strongly influenced CH₄ emissions through its impact on soil O₂ inputs. Both field and laboratory data suggest a coupling between the photosynthetic activity of the vegetation and the release of both CO₂ and CH₄ following the circadian rhythm of the dominant plant functional types. Forest clearance for agriculture resulted in elevated CH₄ release, which we attribute in part to the cessation of root O₂ inputs to the peat. We conclude that high emissions of CO₂ and CH₄ from forested tropical peatlands are likely driven by labile C inputs from the vegetation but that root O₂ release may limit CH₄ emissions.