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A multi-biomarker approach to characterize present and past methane production in newly discovered Amazonian peatlands

Anca E. Amariei (1), Jaime Toney (1), and Katherine H. Roucoux (2)

(1) School of Geographical and Earth Sciences, University of Glasgow, Glasgow, G12 8QQ, UK (a.amariei.1@research.gla.ac.uk; jaime.toney@glasgow.ac.uk), (2) School of Geography and Sustainable Development, University of St Andrews, St Andrews, Fife, KY16 9AL, UK (khr@st-andrews.ac.uk)

Peatlands are regarded as terrestrial archives in which changes in environmental factors can be traced through time (McClymont et al., 2010). They act as important carbon sinks and sources and their stability can be influenced by numerous environmental and anthropogenic factors (Domain et al. 2014). Only recently, the existence of extensive tropical peatlands (i.e. 40,000 km^2) has been confirmed in Amazonia (i.e. Lahteenoja et al., 2009 a, b; 2011). The peatlands appear to be hydrologically intact but are at risk of degradation from anthropogenic impacts and climate change (Roucoux et al., 2017). Their discovery represents a new potential source or sink of atmospheric gas budgets that need to be considered in future climate change scenarios.

Our main interest is to describe methane production in Amazonian peatlands and changes in methane efflux through time, as a function of various environmental parameters. These peatlands support small scale human activity and, as their hydrology is mainly unaffected (Roucoux et al., 2017), they can serve as a model to better understand current degraded peatlands. We are focusing on surface and core samples from Pastaza-Maranon Foreland Basin, northern Peru, whose peatlands were first described in detail in 2011 (Lahteenoja et al., 2011). By employing a multi-biomarker approach, coupled with stable isotope techniques, we will be able to provide further insight into the activity of both anaerobic and aerobic microbial communities responsible for methane production and oxidation, respectively. Samples are associated with three vegetation types (i.e. black-water seasonally flooded forest, short pole and *M. flexuosa* palm swamp), providing thus a wide view over these dynamic ecosystems.

We intend to characterize present and past methane production and oxidation processes from at least one of the vegetation types through the aid of membrane lipid biomarkers and their carbon isotopic signature. Preliminary results indicate, for example, a positive correlation between surface concentrations of diploptene (ug/mg dry peat), a biomarker used to quantify and describe methanotroph communities, and present day methane effluxes. Results from this multi-biomarker approach will be used to explore the relationship between environmental parameters via direct and proxy observations of fluctuations in water table depth, changes in vegetation, hydrology (Roucoux et al. 2013) and methane production, in an attempt to gain a further insight into tropical peatland dynamics and carbon biogeochemical cycles within them. Through this approach, current budgets of greenhouse gases, present condition of stored carbon and influences of this lowland tropical peatland on global systems can be assessed with more confidence in future climate change scenarios and conservation attempts.