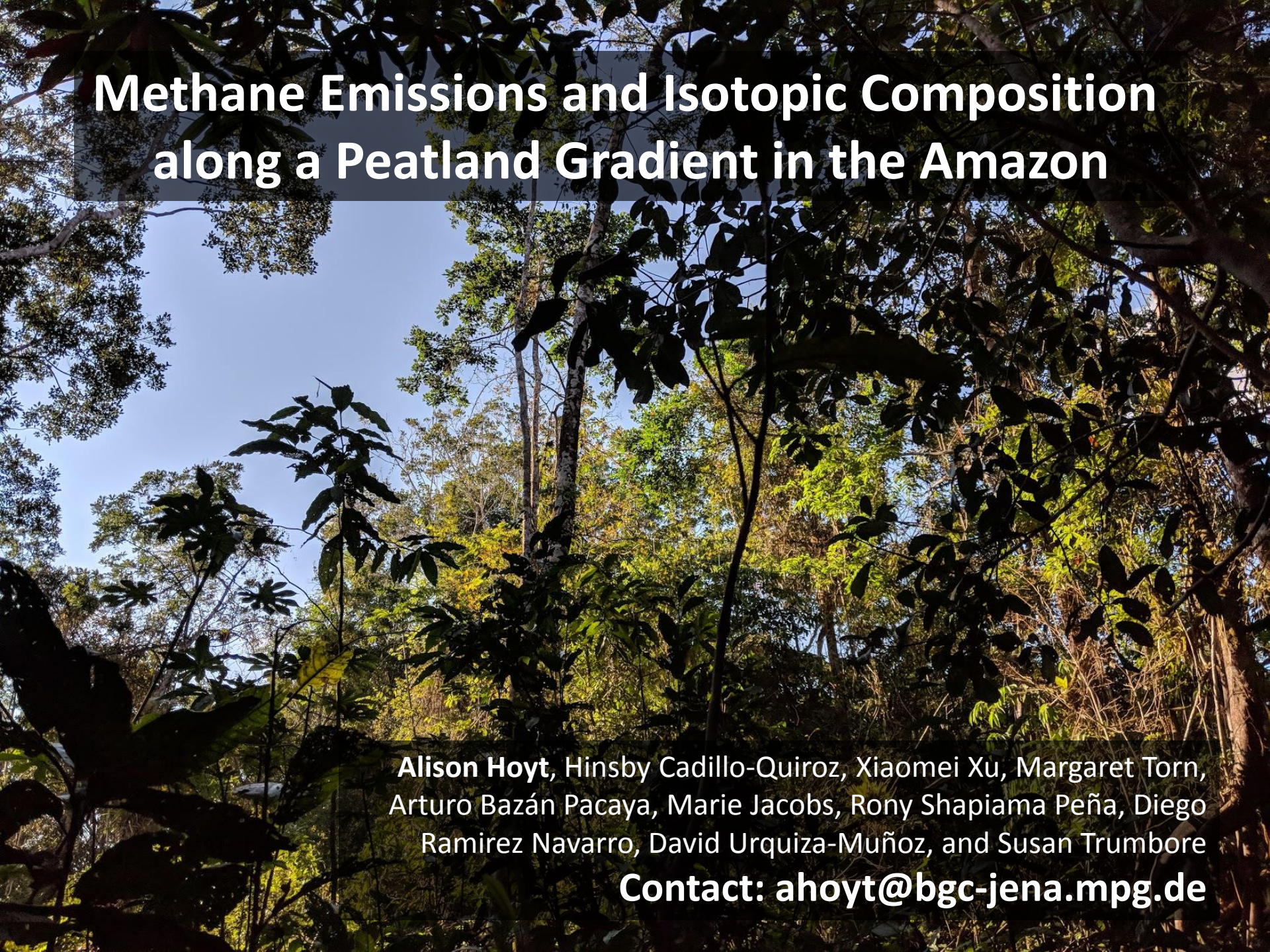
Methane Emissions and Isotopic Composition along a Peatland Gradient in the Amazon



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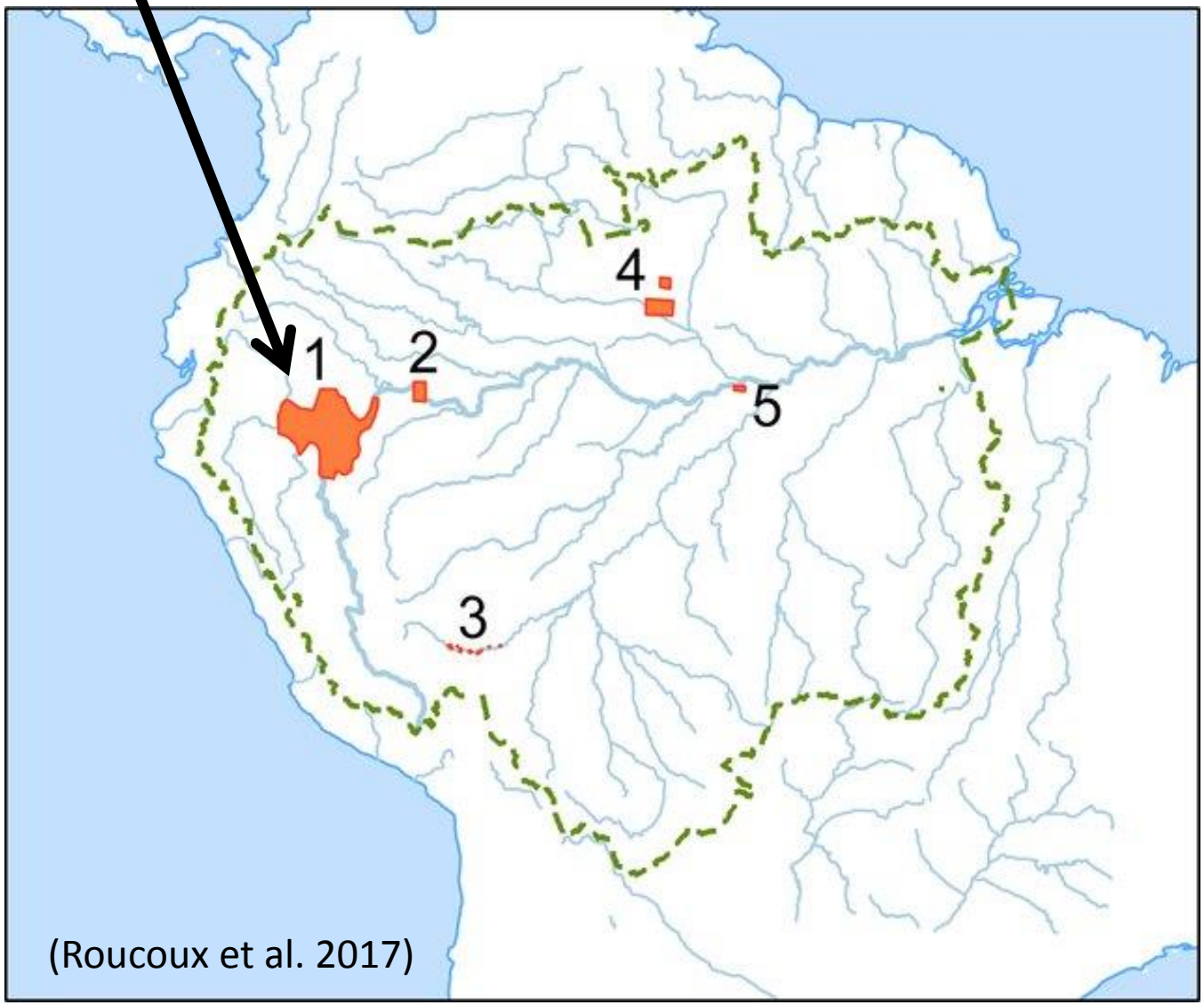
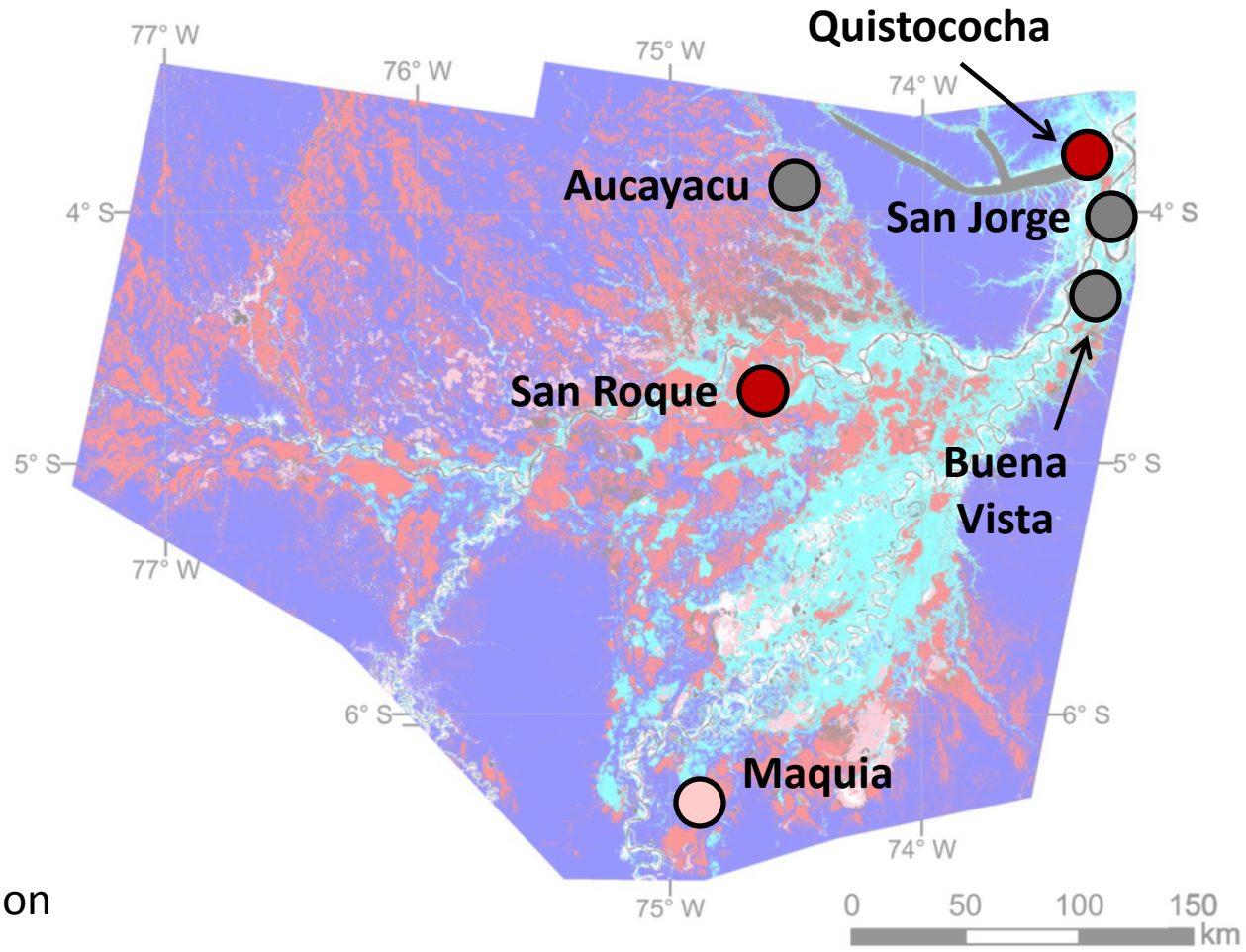
This work: How do CH_4 emissions vary across tropical peatlands with diverse geochemistry, hydrology & vegetation?

Pastaza-Marañon basin peatlands



We selected sites in the Pastaza-Marañon basin to capture the diversity of tropical peatlands

Pastaza-Marañon basin (~35,600 km^2)
Loreto, Peru



Peat-forming vegetation

- Open peatland
- Palm swamp
- Pole forest

Non peat-forming vegetation

- Terra firme/occasionally flooded forest
- Seasonally flooded forest

(Draper et al, 2014)


Mauritia palm swamps


Pole forest peatlands


Other forested peatlands


Open peatlands
(Lähteenoja et al. 2009, 2011, 2012, 2013)

We observed strong links between CH_4 and peatland geochemistry

Ombrotrophic	Intermediate	Minerotrophic
Very Acidic, pH ~ 2.5-4	Acidic, pH ~ 4	Slightly Acidic, pH ~ 5-6
Very low CH_4 emissions	Low CH_4 emissions	Higher CH_4 emissions
CO_2 Reduction Pathway $\delta^{13}C$ of CH_4: -80 to -110‰ $\Delta DIC\text{-}CH_4$: 70-80‰	Mixed Pathway $\delta^{13}C$ of CH_4: -75 to -80‰ $\Delta DIC\text{-}CH_4$: 65‰	Acetoclastic Pathway $\delta^{13}C$ of CH_4: -70 to -75‰ $\Delta DIC\text{-}CH_4$: 60‰
Mixed C source for CH_4	Mixed C source for CH_4	Fresh inputs to CH_4

Conclusions & Implications:

- Geochemistry and nutrient status are strongly correlated with CH_4 production rates and pathways
- CH_4 production pathway, C source and emissions do not correlate with vegetation
- CH_4 production pathways and isotopes are very similar to temperate & boreal peatlands despite differences in hydrology & vegetation (but lighter!)
- Potential for Upscaling: Hydrology x Vegetation