



Large methane emissions from Amazon floodplain trees

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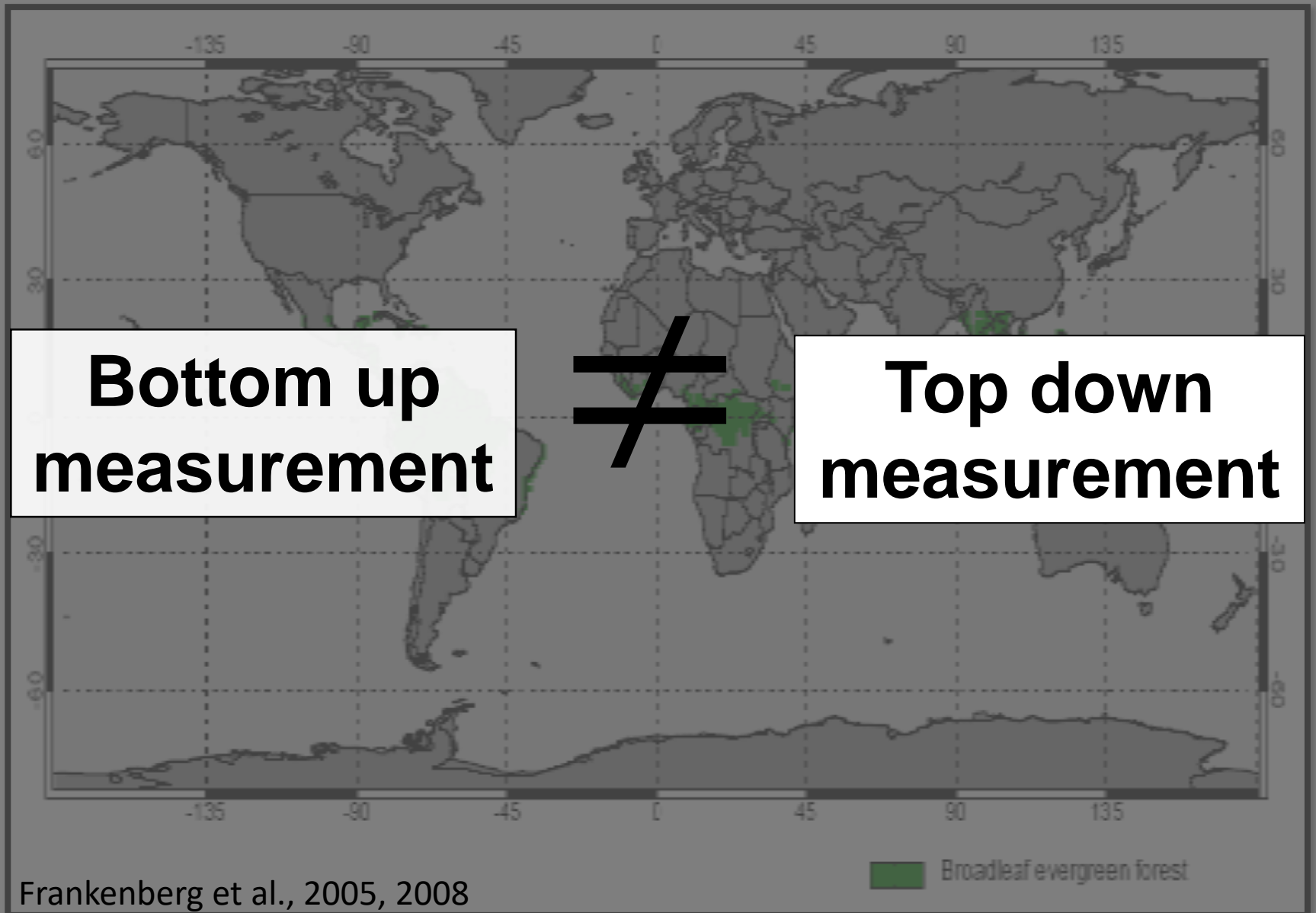
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Methane emissions from wetlands

Wetlands are the single largest natural source of CH₄

Globally up-to 60 % of the wetlands are forested and some of the tropical forests are either permanently or seasonally flooded

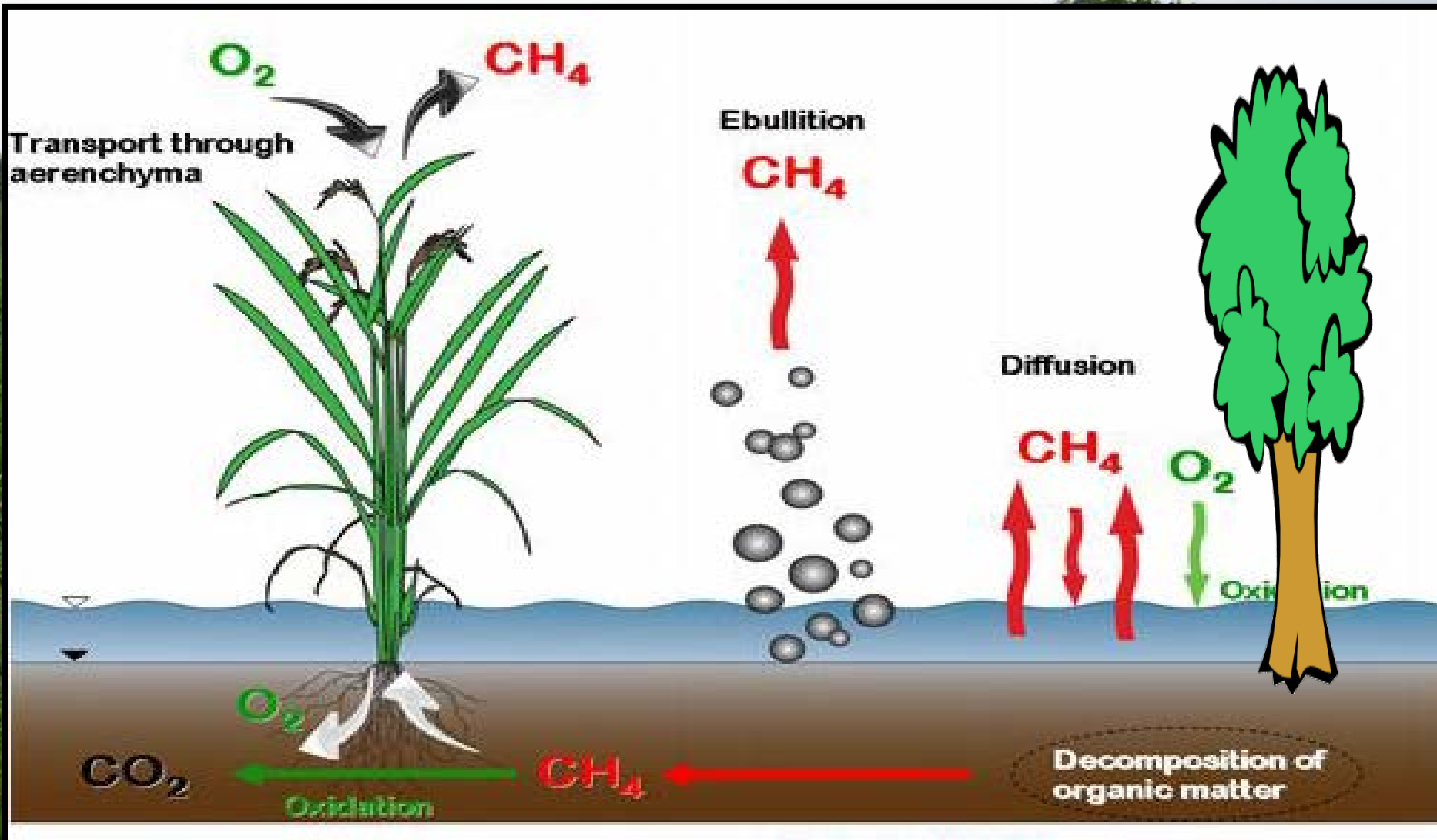
Discrepancies in the Tropics



Possible Hypotheses

- A new methane production pathway
- Inaccurate measurements
- Unaccounted sources (such as fire, termites, microsites, tank bromeliads etc.)
- Unexplored new methane emission pathway

Methane release pathways





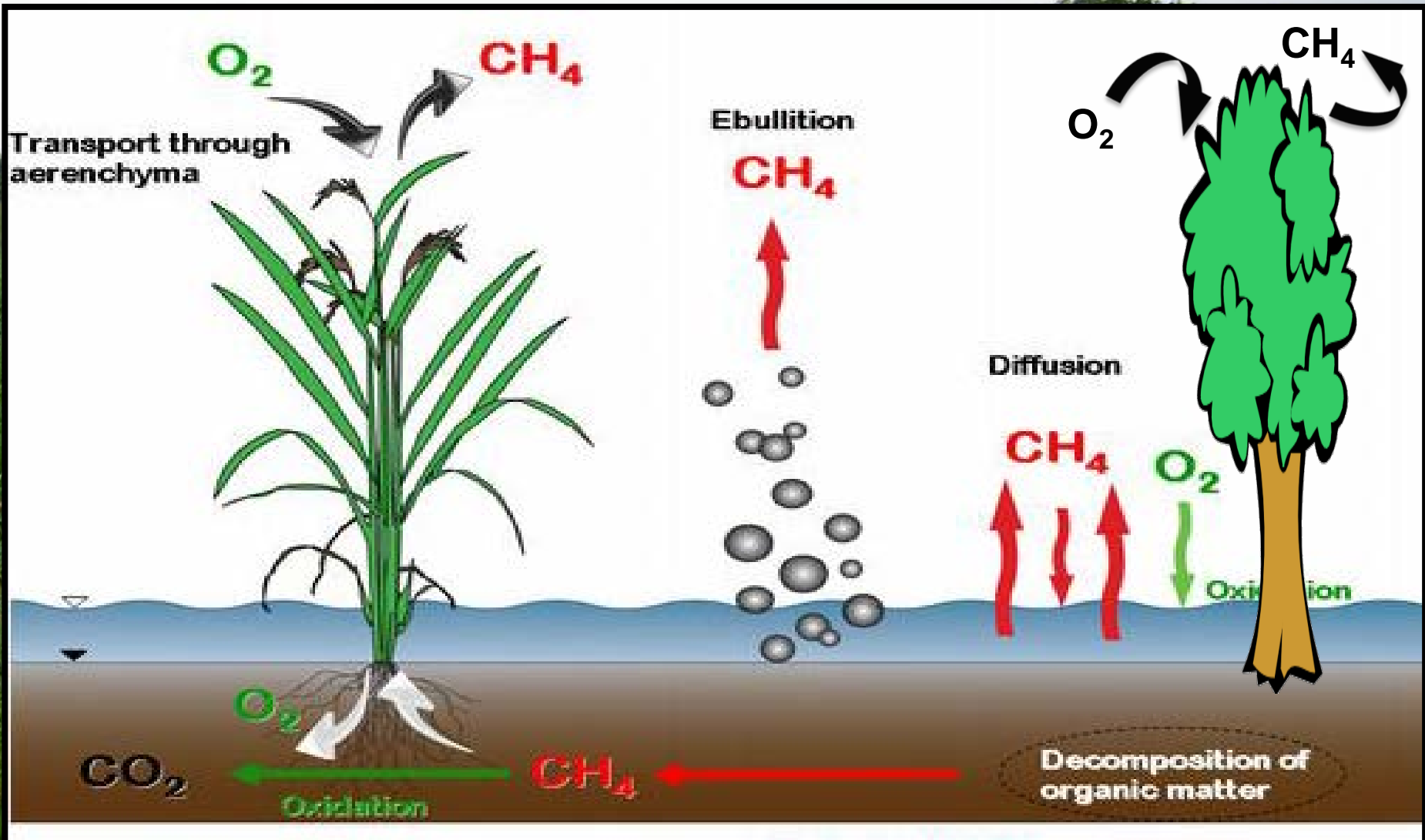
Trees undergo morphological adaptations to survive flooded conditions



Trees undergo morphological adaptations to survive flooded conditions

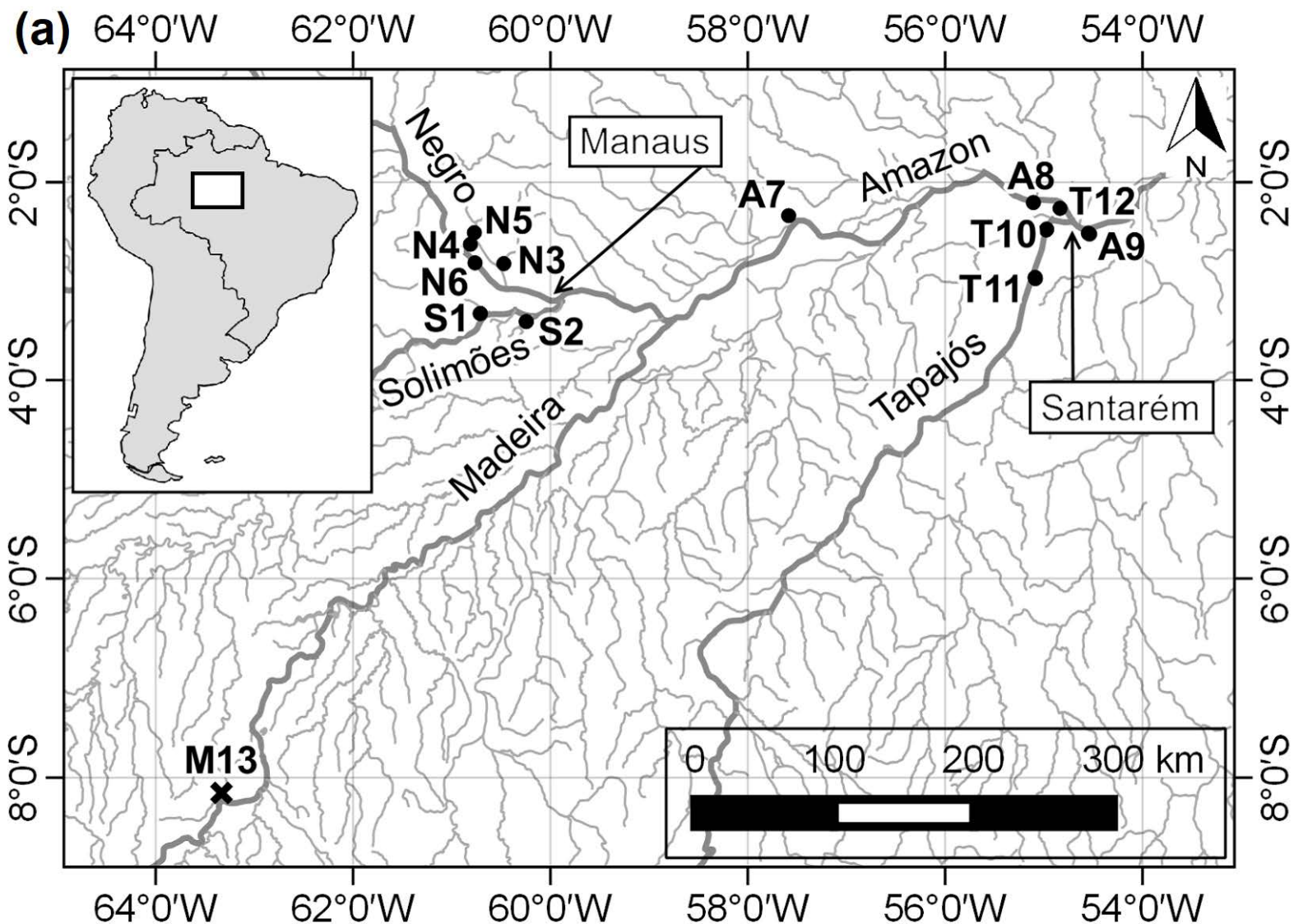


Methane release pathways



Amazon Expedition









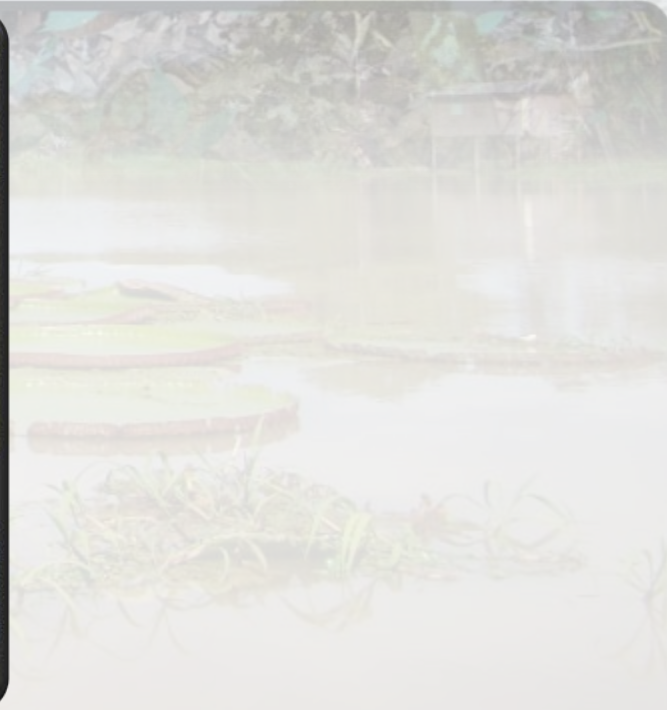








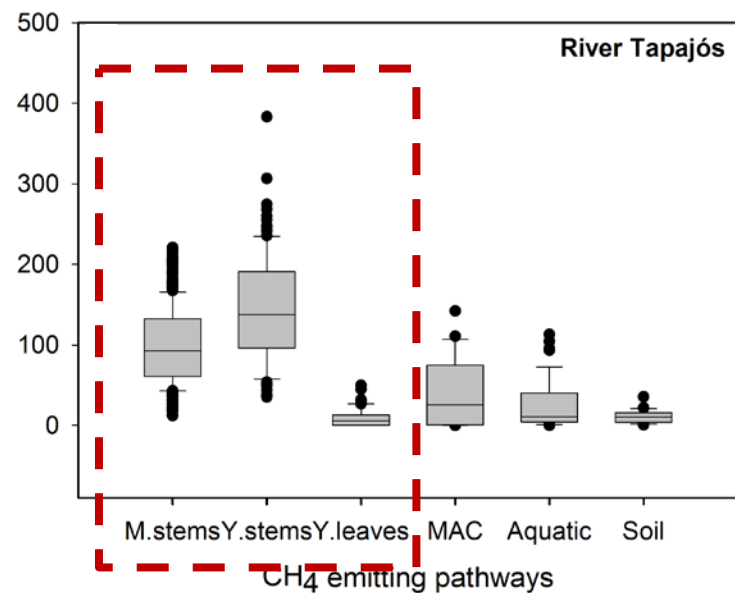
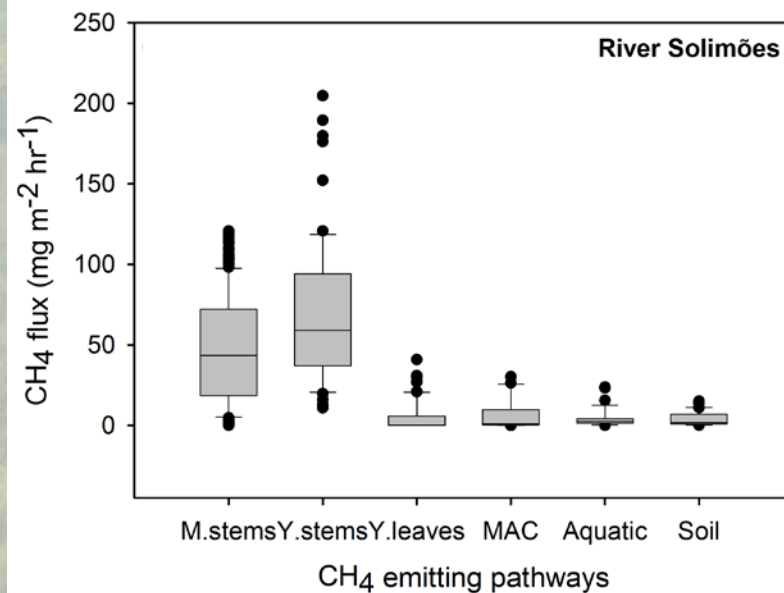
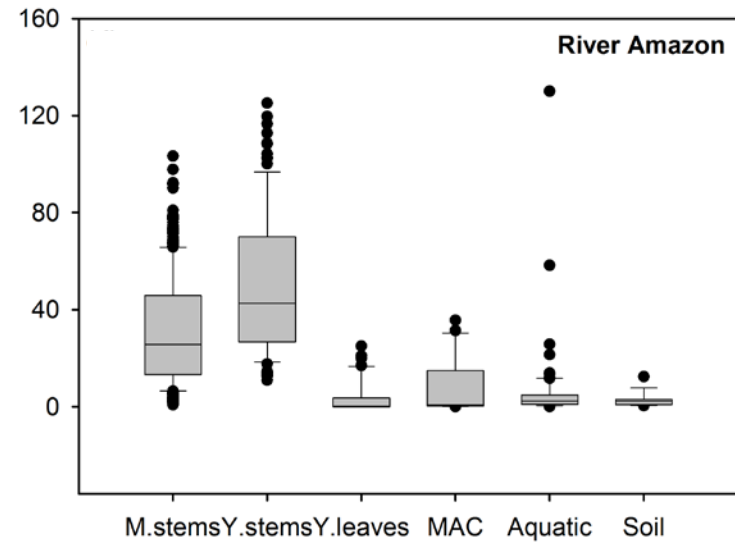
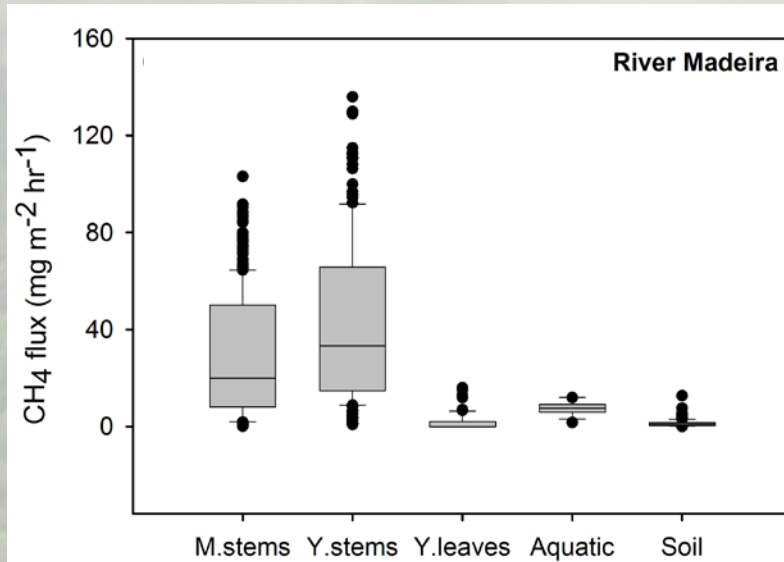


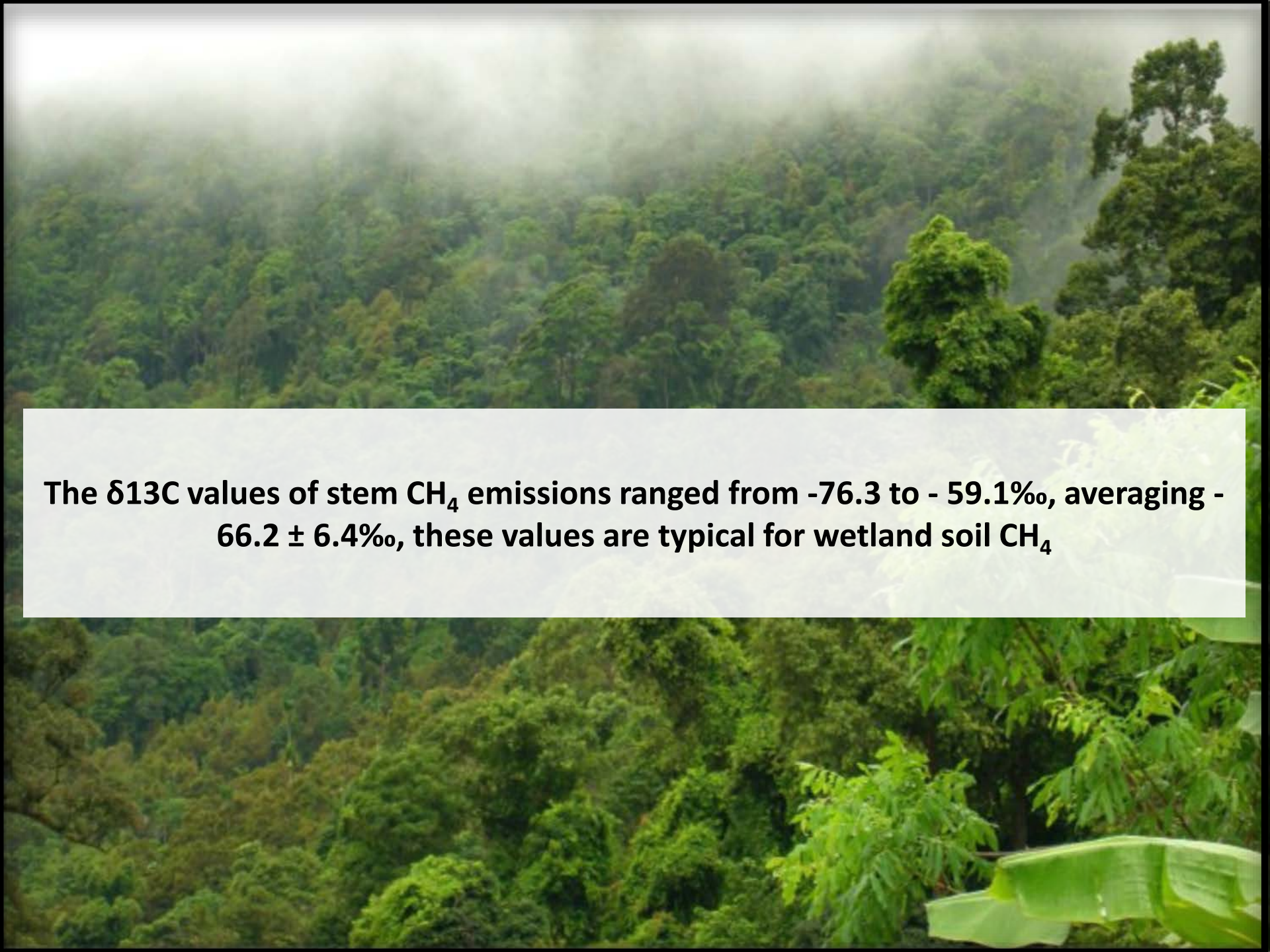


A photograph of a dense, lush green forest, likely a tropical rainforest, shrouded in a thick mist or fog. The trees are tall and their canopies are visible, though the fog obscures some details. The entire image is framed by a thick black border.

Did we see any methane?

Trees are the dominant source of methane





**The $\delta^{13}\text{C}$ values of stem CH_4 emissions ranged from -76.3 to - 59.1‰, averaging -
66.2 \pm 6.4‰, these values are typical for wetland soil CH_4**

CH₄ cycling within trees

Wood cores
extracted using
increment borers at
20 & 130 cm stem
height



Extracted cores
incubated in 50 ml
sealed vials for 24
hours



CH₄ production potential
-N₂ in headspace

CH₄ oxidation potential: high
affinity
-5 ppm CH₄ in headspace

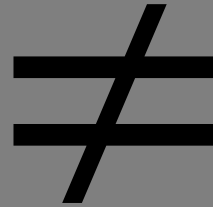
CH₄ oxidation potential: low
affinity
-1000 ppm CH₄ in headspace

Net stem CH₄ fluxes are a result of CH₄ production and uptake within the tree stems in Amazonian wetlands

No of trees sampled	% trees showing evidence of CH ₄ production potential	CH ₄ production potential rates \pm SE ($\mu\text{g CH}_4 \text{ h}^{-1} \text{ m}^{-3}$ vol of wood)	% trees showing evidence of CH ₄ oxidation potential	CH ₄ oxidation potential rates \pm SE ($\mu\text{g CH}_4 \text{ h}^{-1} \text{ m}^{-3}$ vol of wood)
At 20 cm	1.29	168.1 \pm 50.1	4.17 (High affinity)	9.92 \pm 2.75 (High affinity)
1232			61.3 (Low affinity)	808 \pm 93.5 (Low affinity)
At 130 cm	6.42	440 \pm 106	72.4 (High affinity)	35.8 \pm 7.32 (High affinity)
1343			27.2 (Low affinity)	317 \pm 44.1 (Low affinity)

Discrepancies in the tropics

**Top down
measurement**

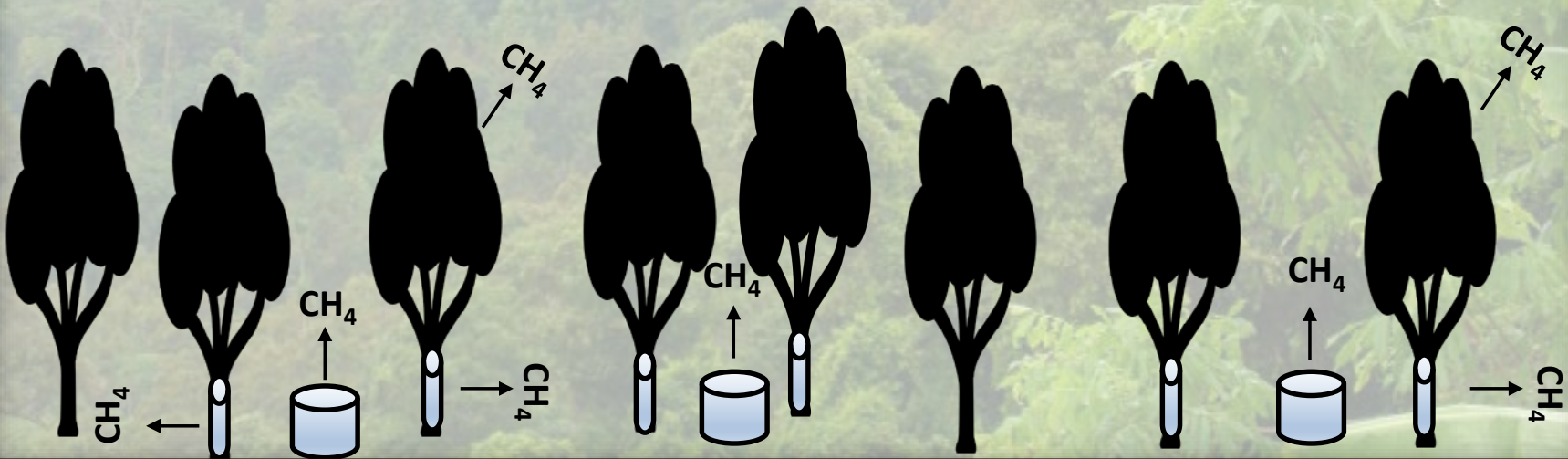


**Bottom up
measurement**

40.2 - 52 Tg yr⁻¹



21 - 27 Tg yr⁻¹ + 19 - 23 Tg yr⁻¹ = 40 - 50 Tg yr⁻¹





Thank you!