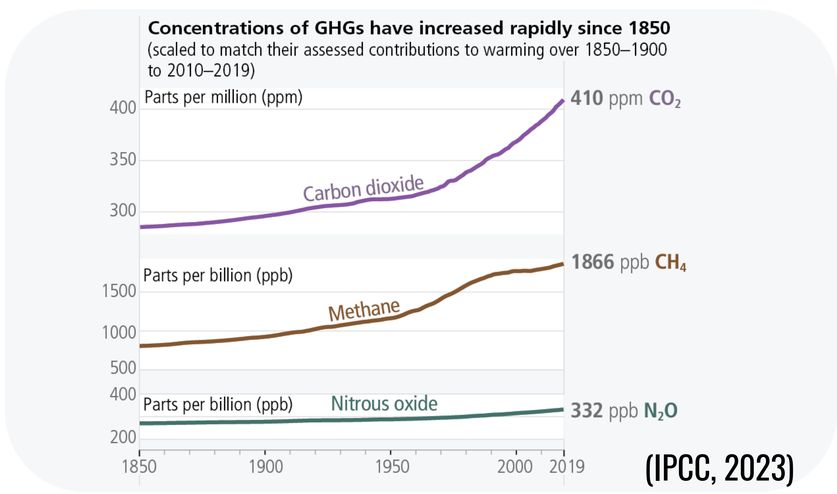
32º CONGRESSO BRASILEIRO DE MICROBIOLOGIA
FOZ DO IGUAÇU / PR | 18 A 22 DE OUTUBRO DE 2023

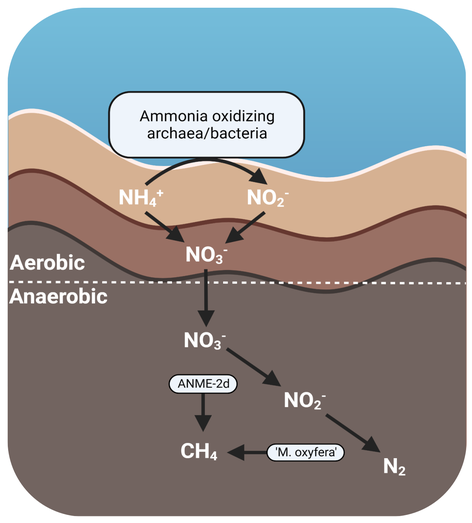
ACTIVE ANAEROBIC OXIDATION OF METHANE IN AMAZONIAN FLOODPLAINS: A POSSIBLE LINK BETWEEN THE METHANE AND NITROGEN CYCLES

MONTEIRO, G. G. T. N.[1*]; BARROS, D. J.[2]; VENTURINI, A. M.[1]; NEU, V.[3]; TSAI, S. M.[1]; NAVARRETE, A. A.[4]

[1]Center for Nuclear Energy in Agriculture - CENA, University of São Paulo, Piracicaba - SP.
[2]Federal University of Tocantins – UFTO, Palmas – TO.
[3]Federal Rural University of the Amazon – UFRA, Belem - PA
[4]University Brazil – UB, Fernandopolis – SP.
*E-mail: guto.motneiro@usp.br

INTRODUCTION





(1) The type of rivers is the major driver of changes in the chemical profile of these soils; (2) Both seasonal shifts in the soil water saturation and changes due to the chemical profile of each floodplain can modulate the methanotrophic/methanogenic microbial communities.

METHODOLOGY

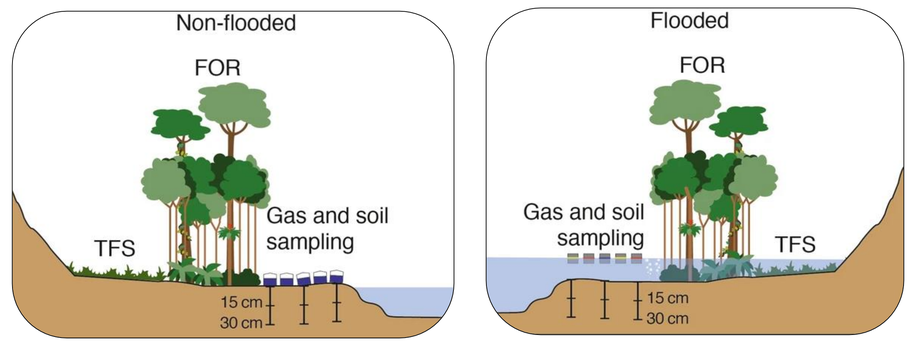


Figure 1. Sampling scheme for the seasonal collection of soil samples

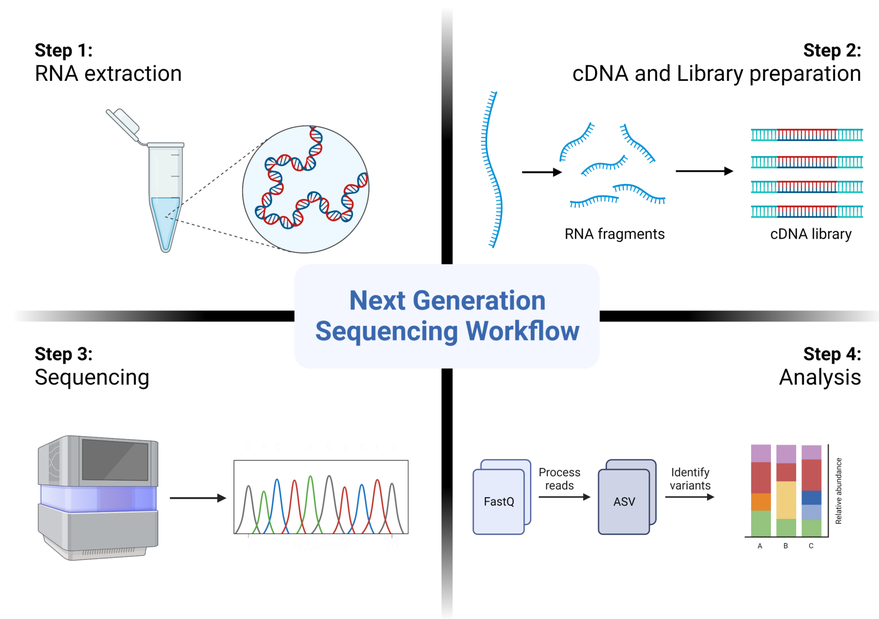


Figure 2. Molecular biology workflow for RNA extraction, cDNA synthesis and amplification of archaeal and bacterial 16s rRNA followed by data analysis

RESULTS AND DISCUSSION

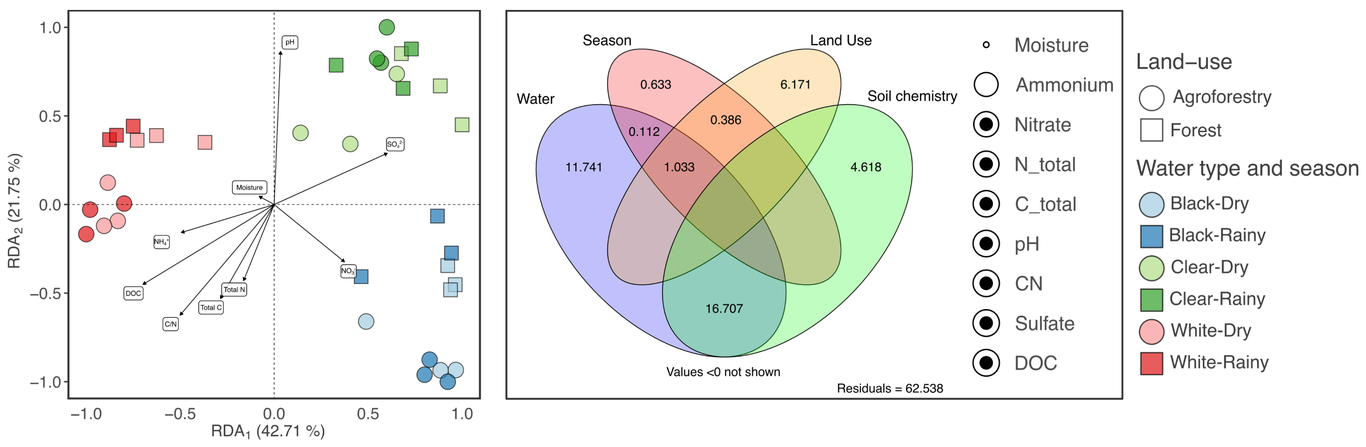


Figure 3. Redundancy analysis (RDA) followed by variance partitioning and permutational analysis of variance (PERMANOVA) of the archaeal community of the floodplain soil from different Amazonian rivers

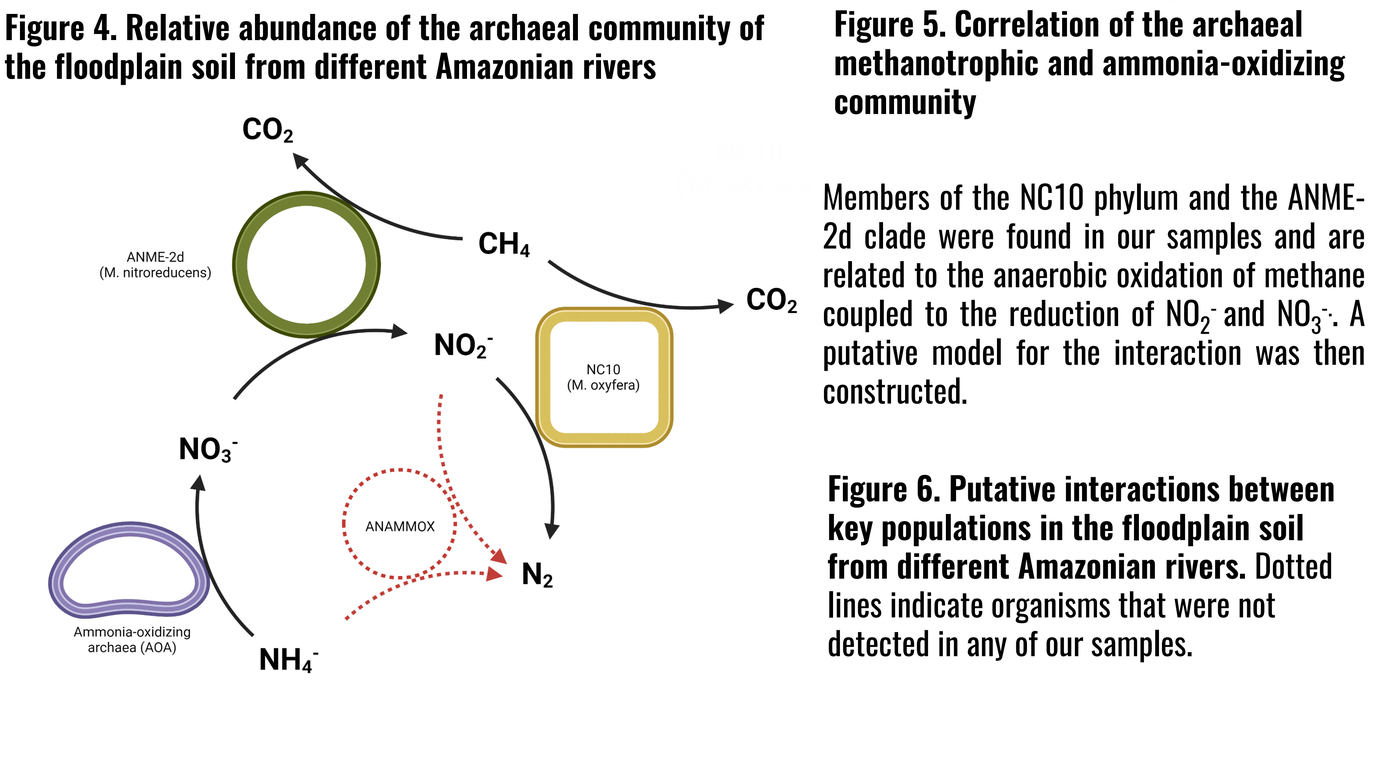


Figure 4. Relative abundance of the archaeal community of the floodplain soil from different Amazonian rivers

Figure 5. Correlation of the archaeal methanotrophic and ammonia-oxidizing community

Members of the NC10 phylum and the ANME-2d clade were found in our samples and are related to the anaerobic oxidation of methane coupled to the reduction of NO_2^- and NO_3^-. A putative model for the interaction was then constructed.

Figure 6. Putative interactions between key populations in the floodplain soil from different Amazonian rivers. Dotted lines indicate organisms that were not detected in any of our samples.

CONCLUSION

- Our data indicates that the flood pulse and the hydrology of these areas are the main drivers of the microbial dynamics in these soils and are correlated not only to the microbial but to the chemical dynamic in the floodplains.
- Different rivers (white, clear, and black water) create different environments and have distinct effects on the microorganisms, favoring for example, ammonia-oxidizing archaea communities that are adapted to acid soils.
- Also, the data suggested a possible interaction between ammonia-oxidizers and methanotrophs in these acidic soils, with a possible link between the carbon and nitrogen cycles through the methanotrophy coupled with the reduction of both NO_3^- and NO_2^-.
- Thus, this is one of the first reports of the active presence of these microbes in Amazon soil, highlighting the possible interaction between biogeochemical cycles in these areas depending of the season.

REFERENCES

IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp.

ACKNOWLEDGEMENTS

CAPES
FAPESP