CARBON FLUXES OF AN AMAZONIAN PALM PEATLAND

Angela Lafuente[1], Daniel Tyler Roman[2], Jhon Rengifo[3], Fenghui Yuan[4], Erik Lilleskov[5], Rod Chimner[1], Lizardo Fachin[3], Jeffrey Wood[6], Daniel Ricciuto[7], Hinsby Cadillo-Quiroz[8], Randall Kolka[9], Craig Wayson[2], Kristell Hergoualc’h[10], Timothy Griffis[4].

[1] Michigan Technological University, Houghton, Michigan, USA;
[3] Instituto de Investigaciones de la Amazonia Peruana, Iquitos, Peru;
[4] Department of Soil, Water, and Climate, University of Minnesota, Saint Paul, MN, USA;
[5] USDA Forest Service, Northern Research Station, Houghton, Michigan, USA;
[6] School of Natural Resources, University of Missouri, Columbia, MO, USA;
[7] Oak Ridge National Lab, TN, USA;
[8] Arizona State University, Tempe, AZ, USA;
[9] USDA Forest Service, Northern Research Station Grand Rapids, MN, USA;
[10] Center for International Forestry Research, Jalan CIFOR, Situ Gede, Sindang Barang, Bogor 16115, Indonesia
14.7 million km\(^2\) of wetlands, of which 7 million km\(^2\) are peatlands (3\%)
Aguajal of Quistococha

The dominant species are:
- *Mauritia flexuosa* (Aguaje) 65%
- *Mauritiella aculeata*
- *Tabebuia insignis*
- *Hevea nitida*

2300 years ago it was another type of vegetation. 400 years ago it was transformed into aguajal.

Average peat depth is 1.92 - 2.45 m. Approximate of 740 tons C ha$^{-1}$.
LI-8100 + LI-7810 + LI-8150 system linked to 6 automated soil chambers + 10 stem chambers
Observed variation on **Carbon fluxes** measured by the automated **soil chambers** during the study period (June-November 2022).
Observed variation on Carbon fluxes measured at 50 cm height (and 90 cm only on *Mauritia flexuosa*) by the automated stem chambers colour-coded by tree species during the study period (June-November 2022).
Averaged CO$_2$ fluxes from soil are higher in the dry than in the wet season.

Averaged CH$_4$ fluxes from soil are higher in the wet than in the dry season.
Averaged CO$_2$ fluxes are higher in Mauritia flexuosa than in Mauritia armata and Tabebuia insignis both in the dry and wet seasons.

Averaged CH$_4$ fluxes are higher in Mauritia flexuosa than in Mauritia armata and Tabebuia insignis both in the dry and wet seasons.
Two of the soil auto-chambers show a diel pattern on CO$_2$ fluxes.

We do not observe a diel pattern on CH$_4$ fluxes from soils.
We observe a diel pattern on stem CO$_2$ fluxes.

We do not observe a diel pattern on stem CH$_4$ fluxes.
Manual measurements done on *Mauritia flexuosa* stem with a Picaro GasScouter show that CH$_4$ fluxes peak at 90cm height and then rapidly decrease after 130 cm from the soil surface.
Measurements done with autochambers linked to LI-8100 + LI-7810 + LI-8150 at 2 heights on *Mauritia flexuosa* stems

**CH₄ fluxes** are significantly higher at 90 cm from the soil surface both during the dry and wet season

![Graph showing methane fluxes](image-url)
Soil CH$_4$ fluxes are positively correlated with temperature and water table depth.

Soil CO$_2$ fluxes are positively correlated with temperature and negatively correlated with water table depth.
Stem CH₄ fluxes are positively correlated with temperature and water table depth.

Stem CO₂ fluxes are positively correlated with temperature and negatively correlated with water table depth.
Eddy Covariance fluxes. Marked in red is the dry season.
Eddy Covariance flux diel patterns during the dry and wet seasons.
Eddy Covariance and chamber diel cycles during the wet season. Note different Y axis scales.
Environmental variables.

- Water Table Depth (m)
- Air Temp (°C)
- Precipitation (mm)
- Soil Temp (°C)
Eddy Covariance fluxes vs Air Temperature & Water Table Position
Conclusions

- Both EC and chamber fluxes show correlation with Water Table position and air temperature
  - 2022 dataset only contains ‘wet season’ so far for EC data
- Diel pattern similar for chambers and EC on CO₂ fluxes
- Neither shows particularly strong CH₄ diel pattern
- CH₄ fluxes from stems are significant and vary by species
Next Steps…

- Addition of Profile system for Lagrangian canopy analyses
- Allometric data to scale stem flux data
- Continue investigating vertical distribution of stem fluxes
- Currently entering dry season… evaluate changes in fluxes
Acknowledgments

Thanks to the AMP Tech Team for providing a loaner LI-7500 to keep the site in operation while our instrument was shipped back to the USA for repairs.

Financial support:
Initial support for tower/site establishment provided in part by the United States Agency for International Development under award number USAID-USFS Participating Agency Program Agreement (PAPA) AID-EGEE-T-16-00001 in support of the Sustainable Wetlands Adaptation and Mitigation (SWAMP) program.

This study was supported by the Office of Biological and Environmental Research in the Department of Energy Office of Science (DE-SC0020167). Other financial supports include the Sustainable Wetlands Adaptation and Mitigation Program (SWAMP, Grant MTO-069018) by the United States of America.