# B31D-08 - Variations in Amazonian forest canopy structure and light environments across environmental and disturbance gradients

Wednesday, 11 December 2019
09:45 - 10:00

- *Moscone West - 3001, L3*

## Swirl Topics

- Natural Resources - SWIRL

## Abstract

A critical problem in tropical forest ecology is understanding how vegetation structure and function vary over environmental gradients. The degree to which forest structure changes across the Amazon basin and the role of environmental variability in shaping forest structure and dynamics are poorly characterised, despite the importance of these forests for regional and global climate. To address these challenges, we connected 10 years of investigations to amass a large database of ground-based profiling canopy lidar (PCL) data from 297 Amazon forest plots across large-scale environmental and disturbance gradients. Mean annual precipitation varied from 1,963 to 3,159 mm, number of dry season months from 0 to 5, and plot soil types covered about half of the variation in phosphorus, exchangeable cation, and soil physical property values observed in Amazonia. We quantified detailed metrics of vertical and horizontal structure and canopy light environments. Forest structure varied considerably across plots; maximum canopy height ranged from 6.1 to 35.7 m, gap fraction from 0.00 to 0.36, LAI from 0.5 to 7.3, rugosity from 1.5 to 7.5 m, and the relative height of 50% light transmission from 0.3 to 0.8. Disturbed sites exhibited almost twice the level of variation (SD) to non-disturbed sites for many metrics. Vertical leaf area density (LAD) profiles also showed high between plot variability, especially at low and high relative canopy heights. Plots with similar LAD profiles sometimes exhibited different distributions of 'canopy photic environment layers'—where canopy leaf area is separated into photic environment layers by depth from canopy surface. This demonstrates that LAD profiles alone are insufficient for characterising canopy environments, essential to light-driven regeneration and carbon cycle processes. In addition, we evaluated relationships between lidar metrics and environmental variables extracted from geospatial layers. Our dataset allows a unique and detailed multi-site analysis of canopy structure and environments across the Amazon, including regions with little or no lidar sampling. Examining how structural attributes alter across environmental gradients is critical to understanding how current and future climate influences Amazonian forest structure, function, and dynamics.

## Authors

- **Marielle Natasha Smith**
  - Michigan State University
- Juliana Schietti
  - INPA National Institute of Amazonian Research
- Nathan Gonçalves
  - Michigan State University

- David Minor
  - University of Maryland College Park
- Danilo Roberti Alves de Almeida
  - University of São Paulo (USP/ESALQ)
- Daniel Gomes Rocha
  - University of California Davis
- Susan Aragón
  - Universidade Federal do Oeste do Pará
- Marcelo Menin
  - Universidade Federal do Amazonas (UFAM)
- Marcelino Carneiro Guedes
  - Embrapa Amapá
- Hélio Tonini
  - Embrapa Pecuária Sul
- Kátia Emídio da Silva
  - Embrapa Amazônia Ocidental
- Diogo Martins Rosa
  - INPA National Institute of Amazonian Research
- Bruce W Nelson
  - INPA National Institute of Amazonian Research
- Carlos Leandro Oliveira Cordeiro
  - Instituto Internacional para Sustentabilidade (IIS)
- Raimundo Cosme Oliveira Junior
  - Embrapa Amazônia Oriental
- Gang Shao
  - Michigan State University
- Mendell S Souza
  - Universidade Federal do Oeste do Pará, Santarém
- Sean McMahon
  - Smithsonian Environmental Research Center (SERC)
- Daniel Almeida
  - Universidade Federal do Oeste do Pará
- Luiz E. O. C. Aragão
  - National Institute for Space Research
- Nicolas Zaslavsky de Lima
  - Universidade Federal do Oeste do Pará
- Gabriel De Oliveira
  - University of Kansas
- Rafael Leandro de Assis
  - INPA National Institute of Amazonian Research
- Jose L Camargo
  - INPA National Institute of Amazonian Research
- Rita G Mesquita
  - INPA National Institute of Amazonian Research
- Scott R Saleska
  - University of Arizona
- David D Breshears
  - University of Arizona
- Flavia Regina Capellotto Costa
  - INPA National Institute of Amazonian Research
- Scott C Stark
  - Michigan State University