How does forest structure control temperature and water fluxes in the Amazon?

Longo, M.; **Saatchi, S.**; **Keller, M.**; **Ferraz, A.**; **Bowman, K. W.**; **Fisher, J.**; **Cawse-Nicholson, K. A.**; **Morton, D. C.**; **Ometto, J. P.**; **Moorcroft, P. R.**; **Shi, M.**

While the role of forest structure on carbon stocks and biodiversity has been extensively studied, its effects on ecosystem functions such as energy and water fluxes at regional scale remain largely unknown. We combine the largest small-footprint airborne lidar collection over the Brazilian Amazon (558 transects randomly distributed across the Amazon covering > 200,000 ha, and collected in 2016-2017) with recent ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS) land surface temperature and evapotranspiration products (70-m resolution, data acquired in 2018-2019) to investigate the role of forest structure on dry-season land surface temperature and evapotranspiration. We compare structural variables including height, vegetation fractional cover distribution, and gap distribution to patterns of temperature and evapotranspiration considering other key variables such as soil texture, disturbance history, and climate. Analyses in the southern Amazon suggest that structural forest changes, associated with forests that burned 2 years prior to ECOSTRESS data acquisition, increase daytime surface temperature by 1-9 ° C and reduce evapotranspiration by 30% during the day, indicating the potentially large effect of structural heterogeneity driving the energy and water cycles in the Amazon. Our analyses provide a framework for integrating forest structure and ecosystem function at global scale fusing ECOSTRESS data with the Global Ecosystem Dynamics Investigation (GEDI) spaceborne lidar mission.

Publication:
American Geophysical Union, Fall Meeting 2019, abstract #B52C-04

Pub Date:
December 2019

Bibcode:
2019AGUFM.B52C..04L

Keywords:

0414 Biogeochemical cycles; processes; and modeling; BIOGEOSCIENCES; 0426 Biosphere/atmosphere interactions; BIOGEOSCIENCES; 0428 Carbon cycling; BIOGEOSCIENCES; 0439 Ecosystems; structure and dynamics; BIOGEOSCIENCES