OKLAHOMA EPSCoR UPDATE

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Forest Degradation Becoming the Largest Driver of Carbon Loss in the Brazilian Amazon

The Amazon rainforest covers approximately 50% of the world's rainforests and nearly two-thirds of the Amazon is in Brazil. The Brazilian Amazon is important for global biodiversity, hydrology, climate, and carbon cycle. Accurate and timely data on spatial-temporal dynamics of the vegetation aboveground biomass (AGB) and forest area in the region are needed to understand the carbon balance, which is affected by land-use, logging and degradation, secondary forest regrowth, and climate.

Dr. Xiangming Xiao from the University of Oklahoma's Department of Microbiology and Plant Biology led an international team of graduate students, post-doctoral researchers and research scientists (Yuanwei Qin, Jean-Pierre Wigneron, Philippe Ciais, Martin Brandt, Lei Fan, Xiaojun Li, Sean Crowell, Xiaocui Wu, Russell Doughty, Yao Zhang, Fang Liu, Stephen Sitch, and Berrien Moore III) to investigate the interannual changes in AGB and forest area by analyzing satellite-based annual AGB and forest area datasets. Specifically, the research team investigated the role of climate anomalies in the changes in forest area and AGB; whether recent changes in policies and human activities in 2019 have a detectable effect on forest area and AGB; and the relative contributions of deforestation and forest degradation (forest fragmentation, edge effects, logging, forest fire and drought) to interannual variation in AGB loss in the study period.

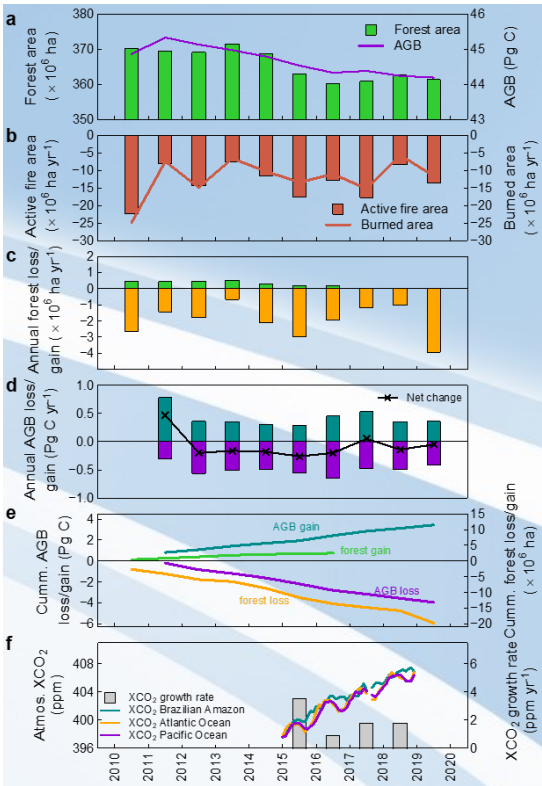

Figure 1. Interannual changes of forest area, aboveground biomass (AGB), active fire area, burned area, and atmospheric CO_2 concentration (XCO_2) in the Brazilian Amazon.

"We used the annual L-band vegetation optical depth (L-VOD) from the Soil Moisture and Ocean Salinity (SMOS) passive microwave images that provide annual maps of AGB and annual forest area datasets to investigate the spatial–temporal dynamics of forest carbon in the Brazilian Amazon during 2010–2019," Xiao said.

The team also found that the Brazilian Amazon had a cumulative gross loss of 4.45 Pg C against a gross gain of 3.78 Pg C, resulting in a net AGB loss of 0.67 Pg C during 2010–2019. Forest degradation (73%) contributed three times more to the gross AGB loss than deforestation (27%), given that the areal extent of degradation exceeds that of deforestation.

"We have attributed the AGB decreases in the Brazilian Amazon to direct human-induced deforestation, selective logging, forest fragmentation and edge effects, forest fires, as well as mortality from climatic disturbances including storms and drought," Qin said.

"This indicates that forest degradation has become the largest process driving carbon loss and should become a higher policy priority in the Brazilian Amazon to achieve the objectives of Reducing Emissions from Deforestation and Forest Degradation (REDD) program and the carbon emission reduction commitment of the 2015 Paris Agreement," Xiao added.

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Upcoming Event: **OK NSF EPSCoR**
Professional Development Seminar Series
July 26, 2021 @ 12 noon