Reducing Uncertainty in Biogeochemical Interactions Through Synthesis and Computation

The RUBISCO Scientific Focus Area (SFA)

U.S. DEPARTMENT OF ENERGY

Office of Science

RUBISCO

Soil moisture variability intensifies and prolongs eastern Amazon temperature and carbon cycle response to El Niño-Southern Oscillation

Objective: To understand how land-atmosphere coupling influences temperature and carbon cycle contrasts between El Niño and La Niña conditions in the Amazon.

Approach: Use the Energy Exascale Earth System Model (E3SM v0.3) to simulate land and atmosphere with observed SSTs during 1982–2016. Three simulations explored variability caused by full coupling (AMIP), sea surface temperatures only (SST_{var}), and soil moisture only (SM_{var}).

Results/Impacts: During the wet season (January–March), the contrast between El Niño and La Niña is driven by coupled ocean–atmospheric teleconnections. Soil moisture anomalies persist into the subsequent dry season in the eastern Amazon, strengthening and extending temperature and carbon cycle responses to forcing by ENSO.

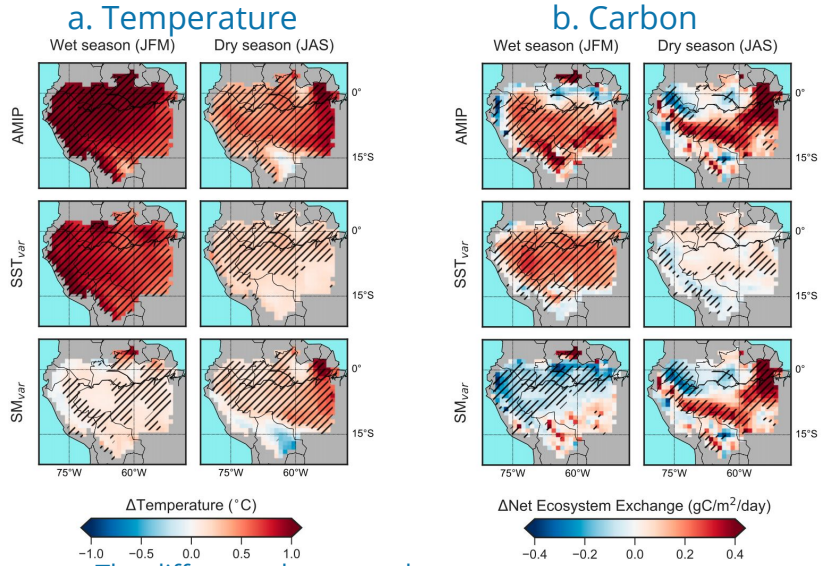

Figure: a. The difference between the mean temperature anomalies of El Niño years and those of La Niña years. Monthly anomalies are averaged across the wet season (JFM, left column) and dry season (JAS, right column). Each experiment (row) is described in the Approach section of the text. b. Same as a., but for monthly anomalies of net ecosystem exchange (positive is a flux to the atmosphere).

Levine, P. A., **J. T. Randerson**, **Y. Chen**, M. S. Pritchard, **M. Xu**, and **F. M. Hoffman** (2019), Soil moisture variability intensifies and prolongs eastern Amazon temperature and carbon cycle response to El Niño-Southern Oscillation, *J. Clim.*, 32(4):1273–1292, doi:10.1175/JCLI-D-18-0150.1.