Title: **Modeling water available to plants to improve understanding of tropical forest response to drought and land use land cover change**

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Project Abstract:
Improving modeling of water available to plants is important for understanding how tropical forest responds to land use land cover change and drought. Here we present two parallel efforts to understand the processes that control the water available to plants. The first effort focuses on improving modeling of lateral processes, which have important effects on groundwater table and soil moisture, with consequential impacts on water available to plants and their response to drought. Land surface models such as E3SM Land Model (ELM) represent surface and subsurface hydrologic processes using a vertical column so lateral processes must be parameterized. To facilitate the development of parameterizations of lateral processes and to provide a benchmark for the parameterizations, ELM is being coupled to ParFlow so that hillslope scale hydrology can be represented in ELM. ParFlow is called from ELM through an external model interface. Data transfer between the two models is realized using mapping files in order to resolve the different domain decomposition approaches used in ELM and ParFlow for parallel computing. Simulations will be performed using ELM and ELM-ParFlow over the Amazon basin to assess the soil moisture and groundwater table depth and how they are modulated by surface heterogeneity and plant hydraulics in the basin. In a parallel effort to improve modeling of tropical forest response to land use land cover change, flux tower data from Agua Salud are used to parameterize C4 grass in FATES to improve modeling of the water and carbon dynamics of C4 grass. Numerical experiments are being performed using ELM-FATES to simulate the impacts of land cover change from mature forest to C4 grass and forest clear-cut. Analysis will be presented to evaluate the impact on seasonal water and carbon cycle dynamics in Agua Salud, with a particular focus on how land cover changes modulate the water available to plants and the interactions between water and carbon cycle processes.