

## Poster #9-14

### Advancements in the Functionally Assembled Terrestrial Ecosystem Simulator (FATES): Functional Hypotheses, Software and Testbeds

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The Functionally Assembled Terrestrial Ecosystem Simulator (FATES) is a dynamic, size and age structured, trait-filtering vegetation model. This model is an application of the Model- Experiment (MODEX) framework of the NGEE-Tropics project. It is developed with a mission to assess how forest dynamics interact with water, carbon and nutrient cycles and their subsequent impacts on global ecosystem health and energy interests. In the past year FATES has been coupled to ELM, the land model of E3SM (Energy Exascale Earth System Model). FATES allows the E3SM code to move beyond bioclimatic constraints to better represent the impact of dynamic plant competition, vertically structured canopies, and disturbances effects on vegetation.

Various improvements and advancements have been contributed to the FATES model over its development phase with the NGEE-Tropics project, which are grouped into three areas: 1) New and competing functional hypotheses have been introduced to represent various alternative processes, such as allometric relationships, and the ability to turn on/off modules like logging, fire, hydraulics, and leaf-biophysics; 2) Software codes were improved to obtain stability, extensibility, reproducibility, testing, introspectability, readability, etc.; and 3) Functional improvements to the model to accommodate science objectives, testbeds of tropical sites of interest to NGEE-Tropics, which can be used to enable parameterization and evaluation of the model.