

FATES and NGEE-Tropics Updates

C. Koven, R. Knox, R. Fisher, and many others on
NGEE-Tropics and FATES teams

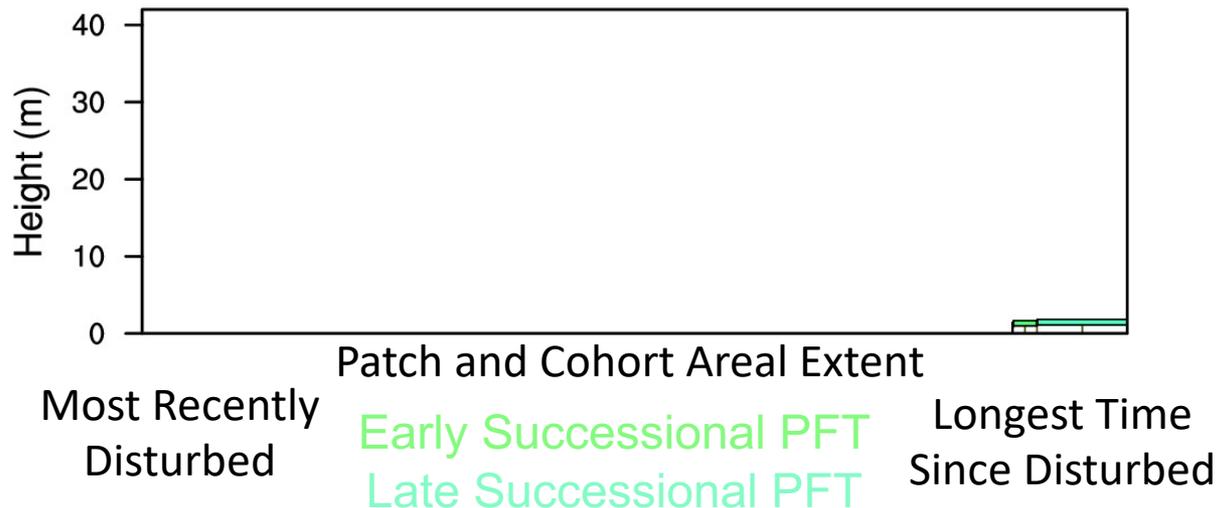
ESS Cyber-Infrastructure Working Group Meeting

Zoom

5/11/2020

NGEE-Tropics (Phase 2 recently accepted)

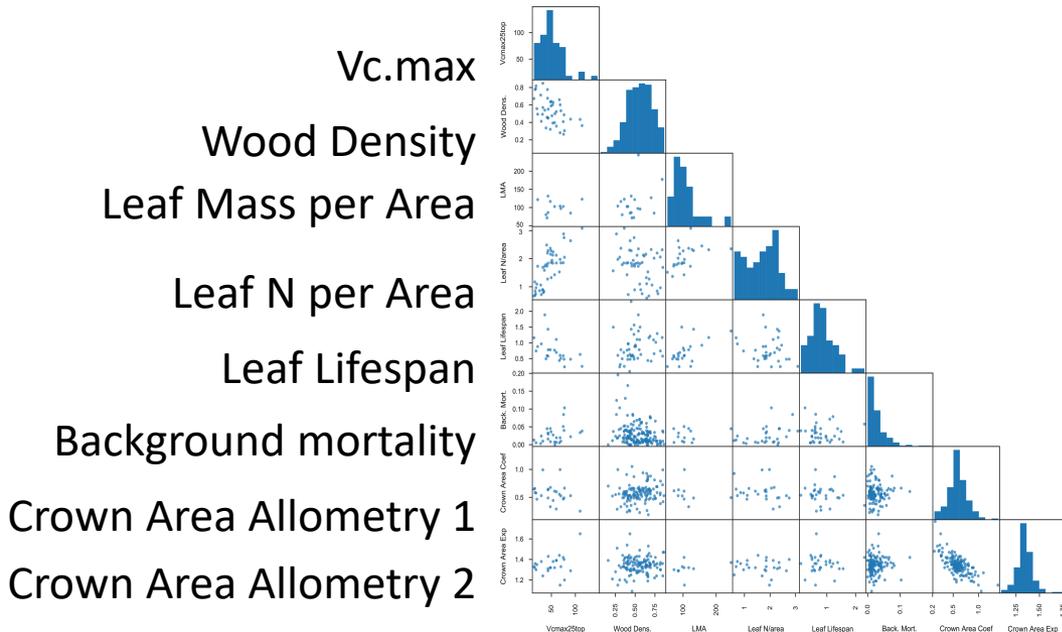
- NGEE-Tropics goals: Understanding tropical forest dynamics in a changing Earth system, and representing these dynamics within E3SM
- FATES model: Size-, Age-, and Trait-structured vegetation model for E3SM that resolves growth, disturbance, and competition of cohorts of plants



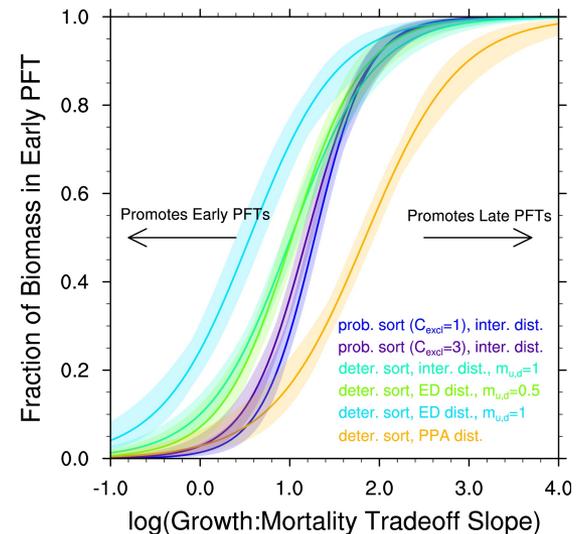
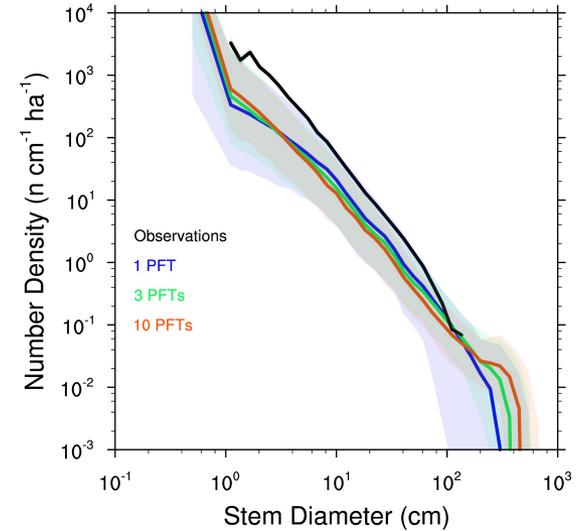
Koven et al.,
Biogeosciences,
in press/2020

FATES Testbed sites: Phase 1: Barro Colorado Island; Phase 2: many more

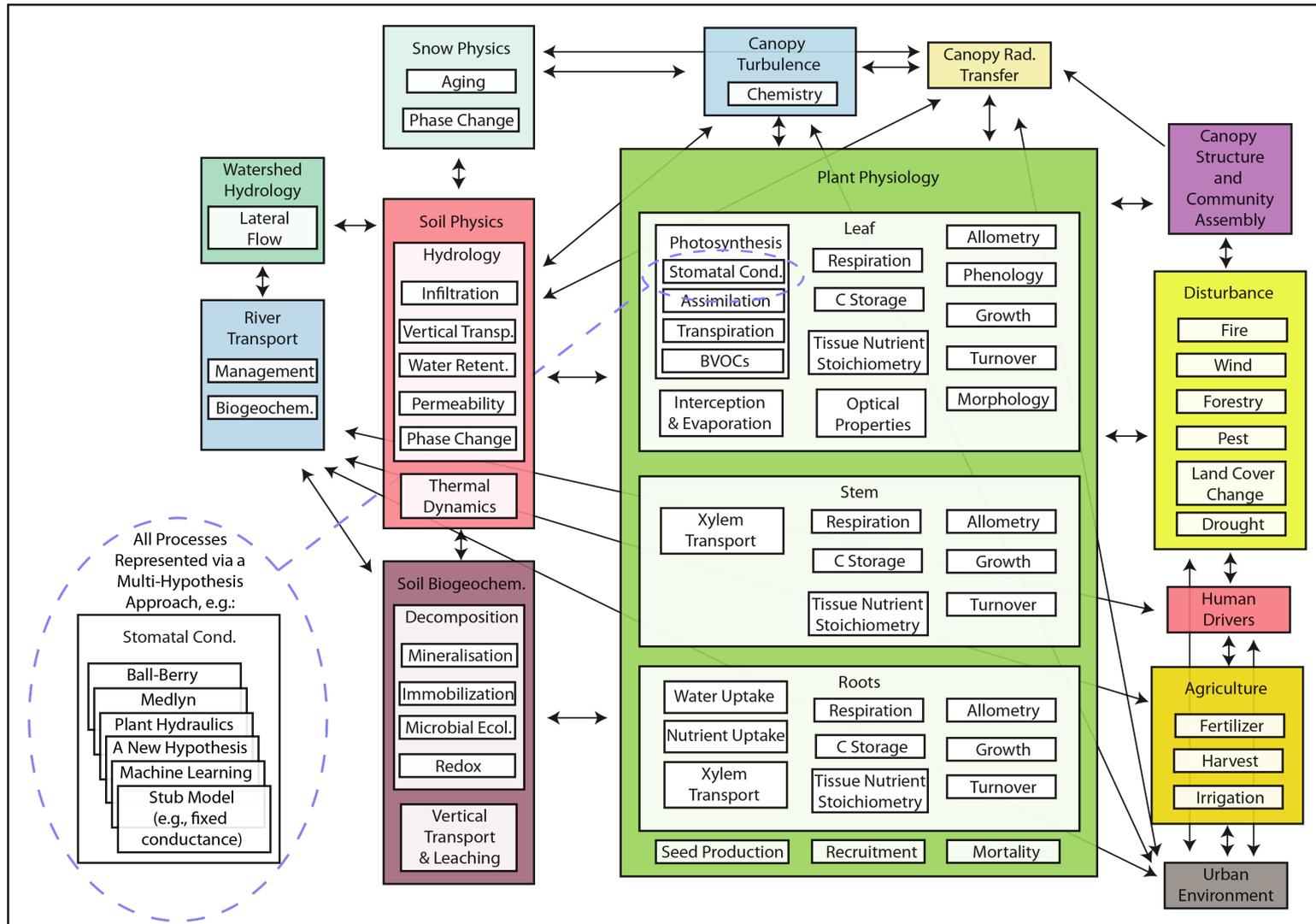
Plant trait data (along with other driving and testing data)



Koven et al.,
Biogeosciences,
in press/2020

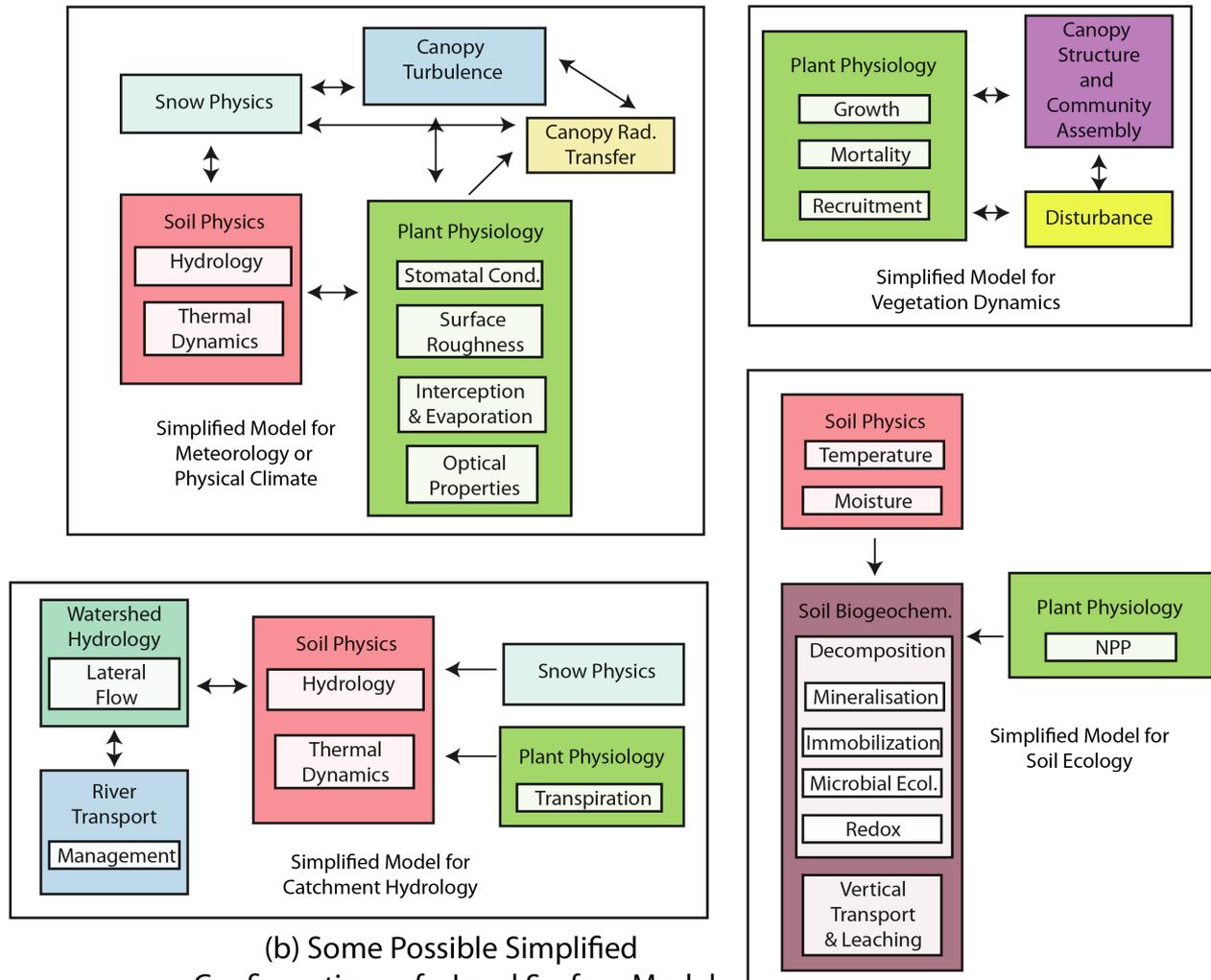


Given the massive scope of contemporary LSMs, how do we manage both process and structural complexity?



(a) Process Schematic of a Possible Full-Complexity Configuration of a Land Surface Model

How can we allow multiple simpler model configurations using the actual LSM code?



(b) Some Possible Simplified Configurations of a Land Surface Model

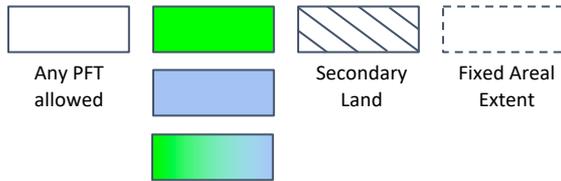
Some current FATES developments

- Further development of plant hydraulics
 - Multiple numerical solvers, better linkages to growth and mortality dynamics
- Multiple nutrient cycles, following multi-hypothesis approach
 - Extensible library, “PARTEH” allows specifying n nutrient cycles, flexible hypotheses in how nutrient and carbon cycles couple
- Multi-process representations
 - Stomatal conductance, plant allometry, photosynthetic acclimation, ...
- Reduced complexity modes

Diagram of fates patch/cohort structure in reduced-complexity configurations (1 of 2)

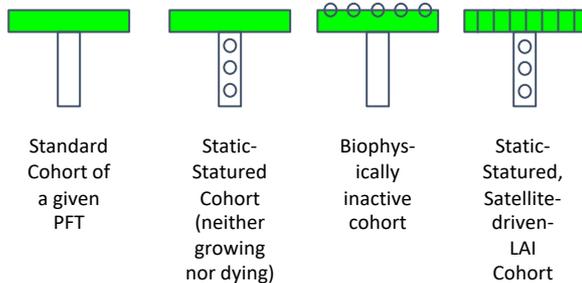
Key

Patch types



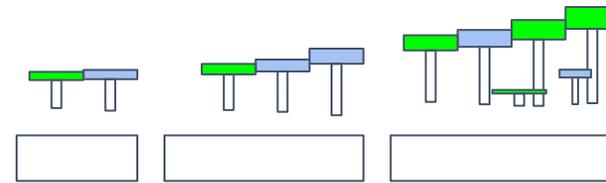
Fixed (or specified time-varying) sum of areas across possibly multiple patches

Cohort types

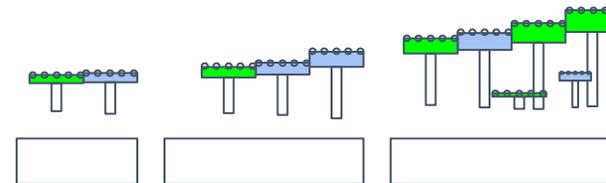


Current modes

Full FATES



Prescribed Physiology



Static Stand Structure

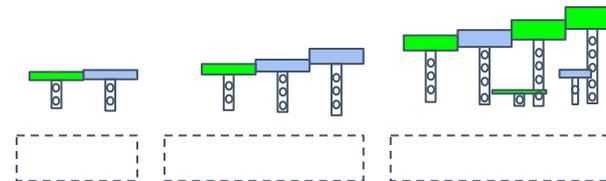
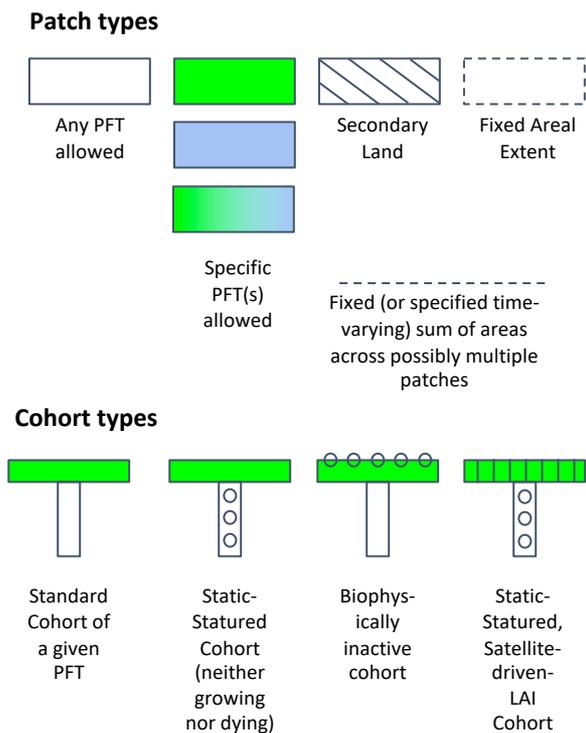


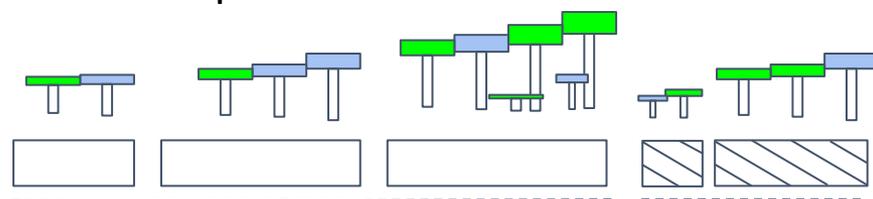
Diagram of fates patch/cohort structure in reduced-complexity configurations (2 of 2)

Key

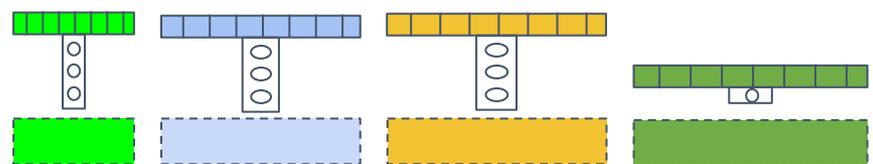


Proposed modes

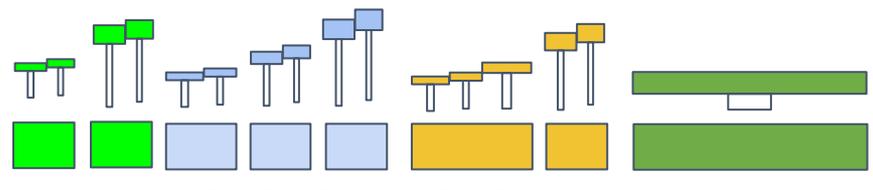
Full FATES
with land use



FATES-Satellite
Phenology



FATES-Prescribed
Biogeography
(nocomp)



FATES-Prescribed
Biogeography
(comp)

