SCIENCE DRIVER

- Root hydraulic redistribution can strongly impact surface energy budgets, yet this mechanism is absent from most climate-scale land models
  - May be critical for tropical systems
- We implemented the Amenu-Kumar model in CLM4.5
- We analyzed impacts on site and global ET and tested two numerical implementations of the model

METHODS

We modified CLM4.5 by:

- Using soil water retention curve and bare soil resistance formulation from Tang and Riley [2013a, b]
- Integrating the big-root model of plant root hydraulic redistribution [Amenu and Kumar, 2008]
- Using three pedotransfer functions
- Sequential and tightly coupled numerical solvers

RESULTS

- At Blodgett Forest, the improper numerical solution gave predictions closer to observations
- At Tapajos, no combination of parameters produced a good match with observations

Seasonal ET differences between FLUXNET-MTE and CLM4.5 with tightly coupled root hydraulic redistribution.

Impact of vegetation removal with the default and tightly coupled schemes.

Conclusions

- Sequential implementation is numerically incorrect
  - However, it performed better compared to measurements than correct implementation
- Compared to FLUXNET-MTE predictions, including root hydraulic redistribution in CLM4.5 resulted in:
  - Poor tropical ET predictions, regardless of pedotransfer function or climate forcing
  - Vegetation removal still increases ET in Tropics
- These results imply substantial work remains for hydrological modeling in NGEE-Tropics