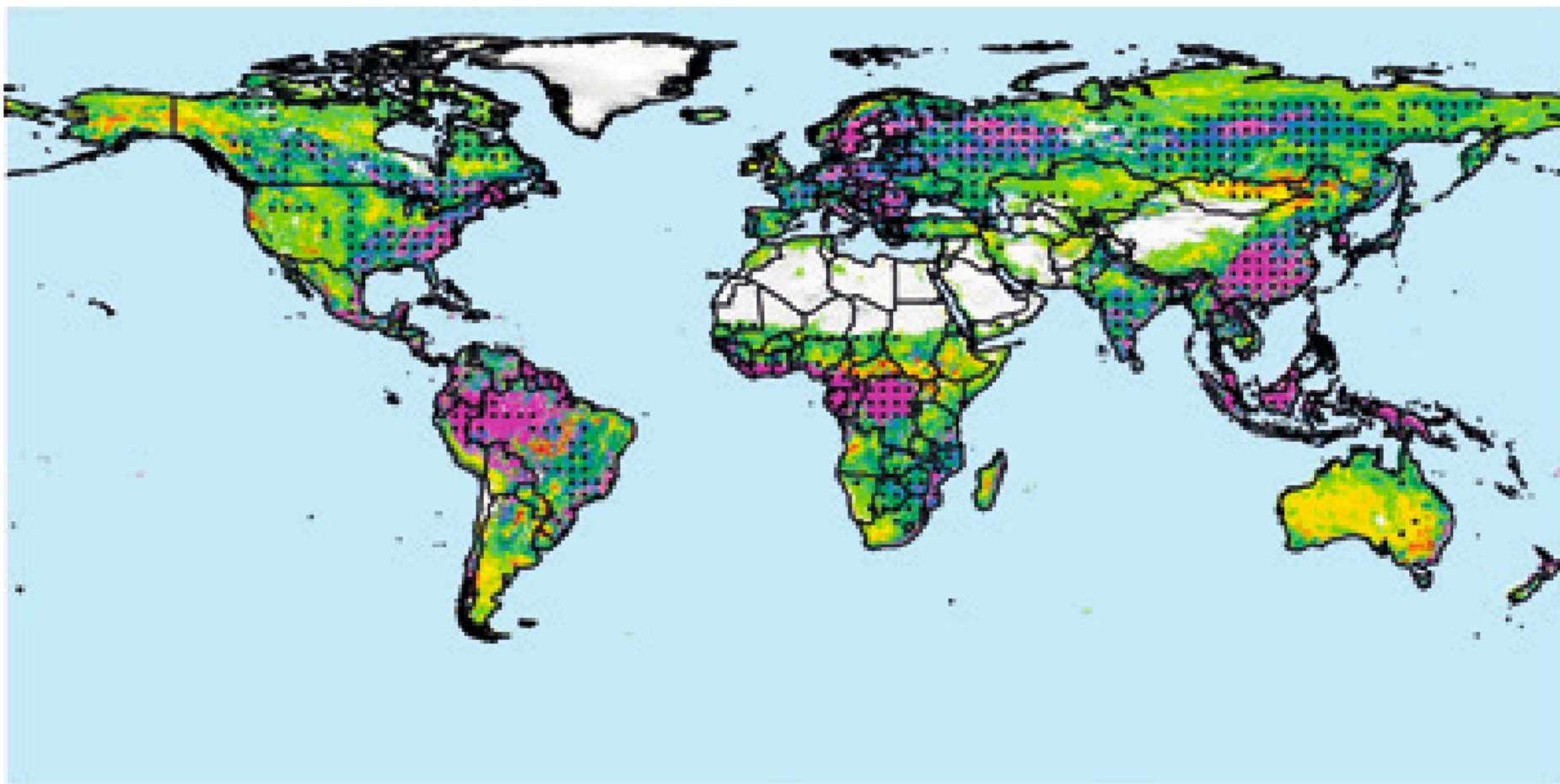


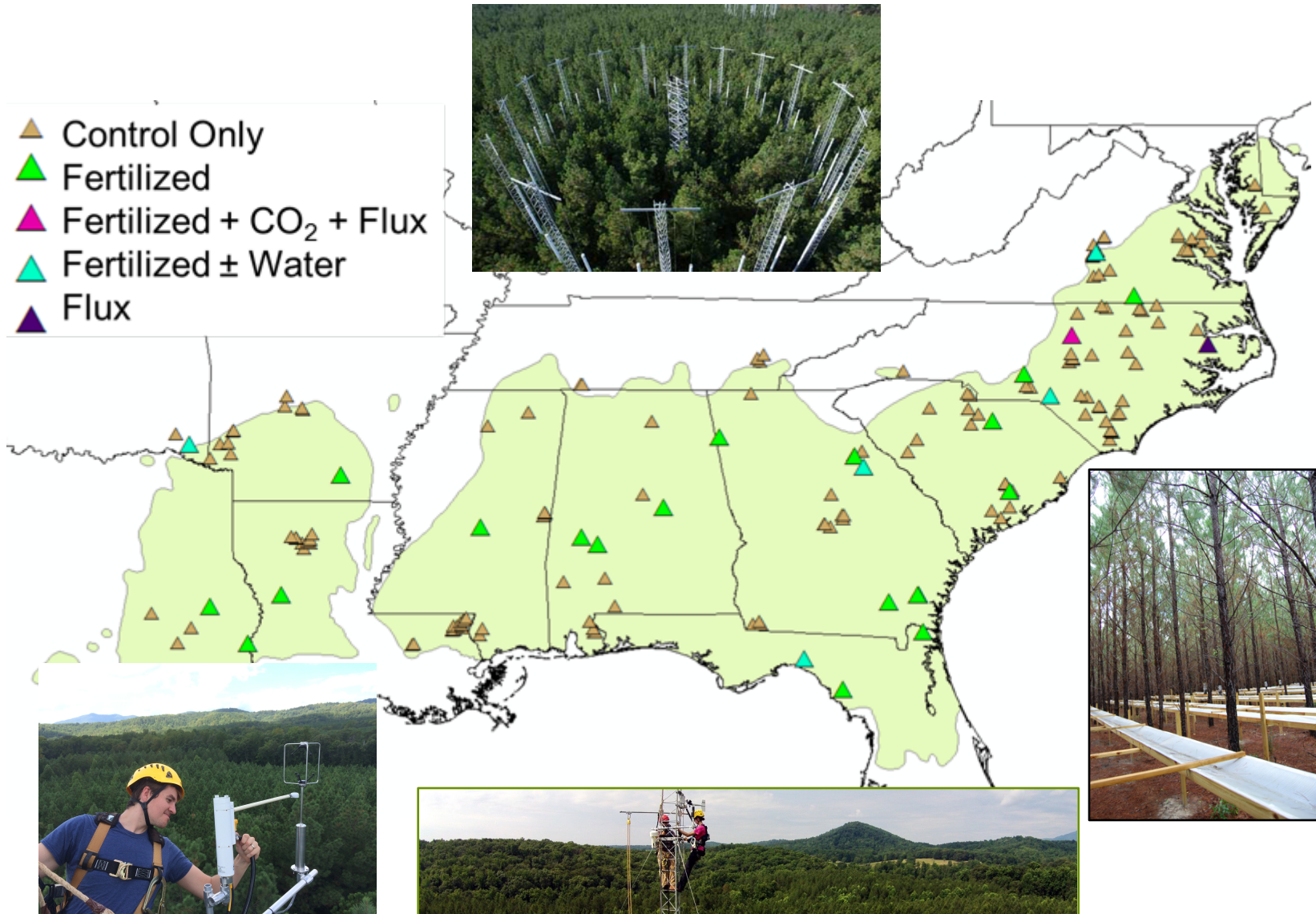
# Southern pine productivity: Effects of carbon dioxide increases and related predicted temperature and precipitation changes

Randolph H. Wynne and R.  
Quinn Thomas on behalf of the  
PINEMAP Modeling Team

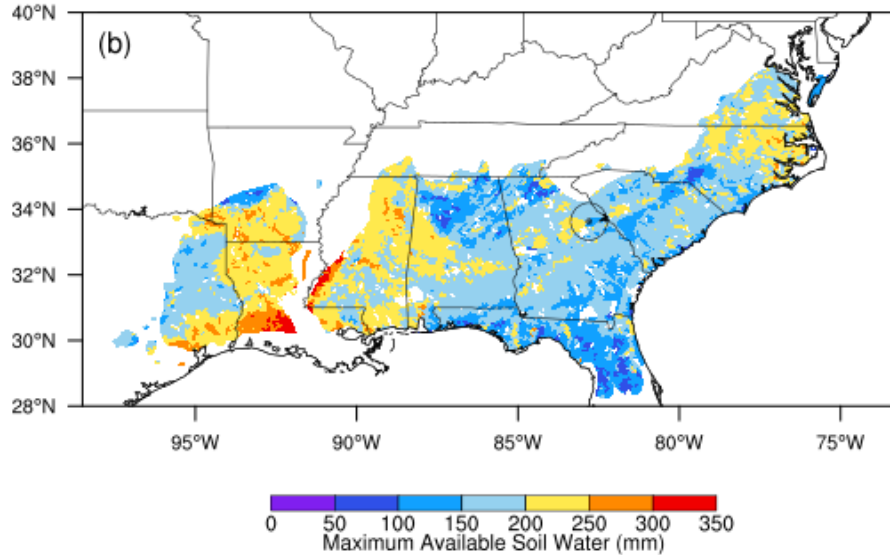


Trend in GLASS LAI ( $10^{-2} \text{ m}^2 \text{ m}^{-2} \text{ yr}^{-1}$ )

# Data: Experimental treatments

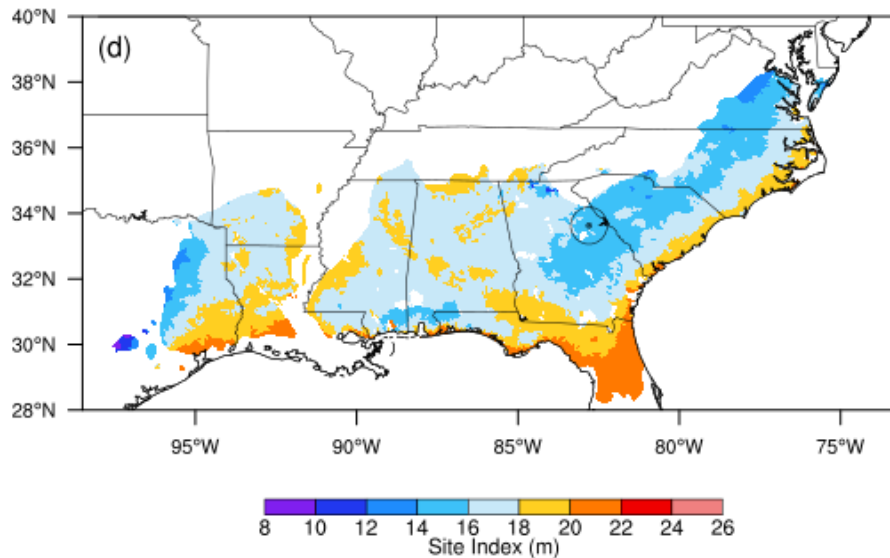


# Key inputs in models



## Soil information

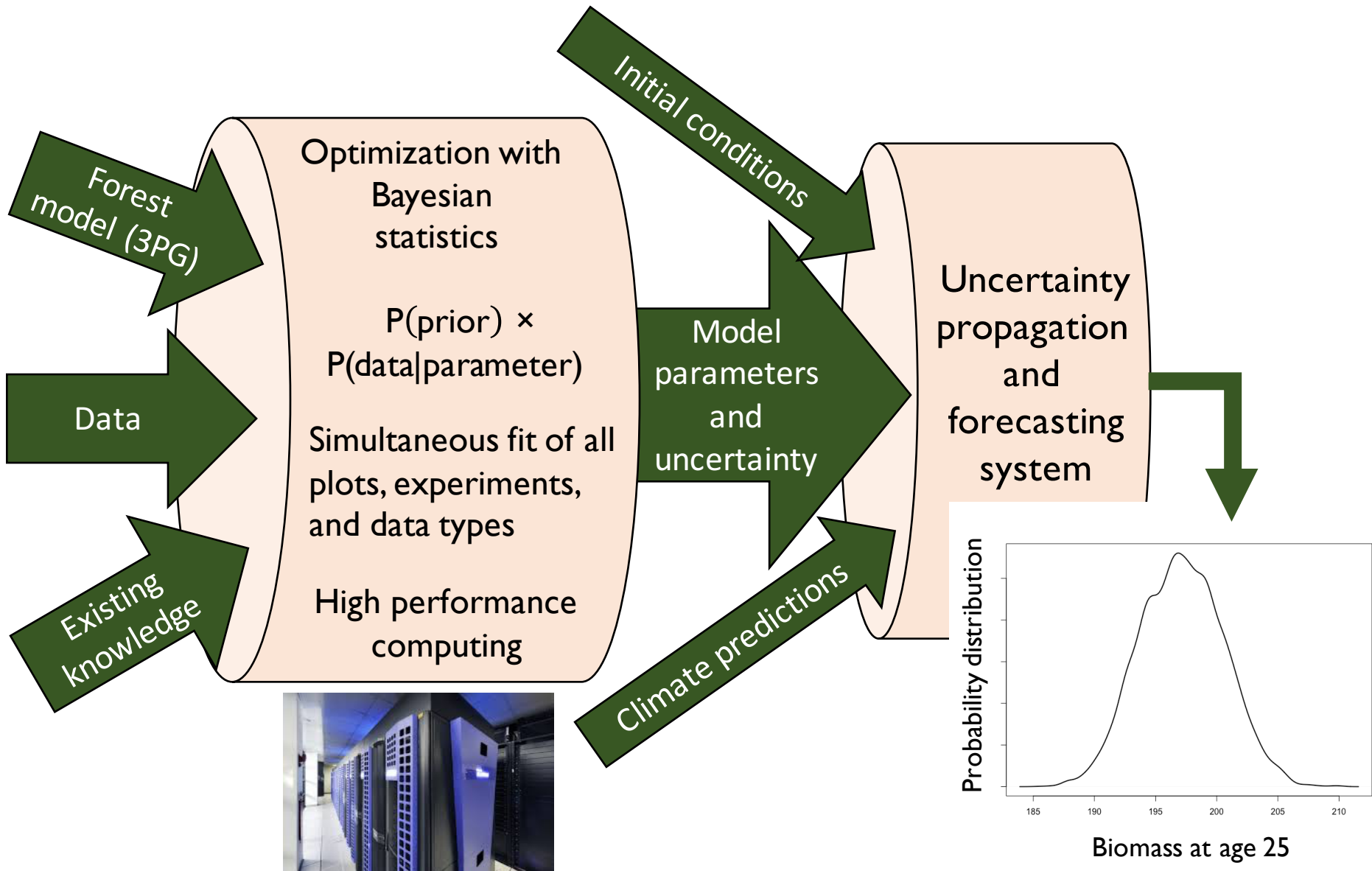
- Maximum available soil water
- Soil texture



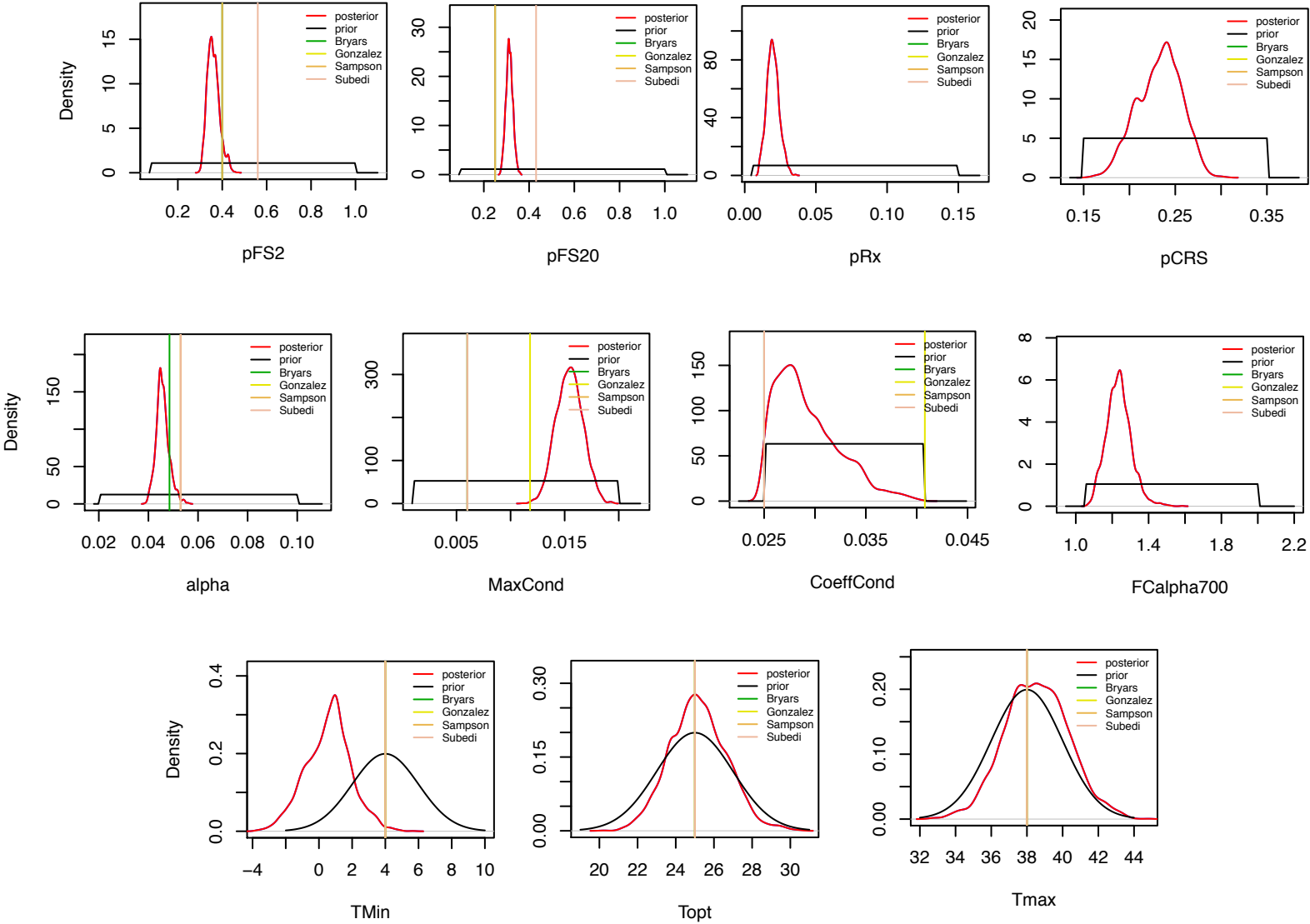
## Measure of site quality

- Site index
- Biomass at an age

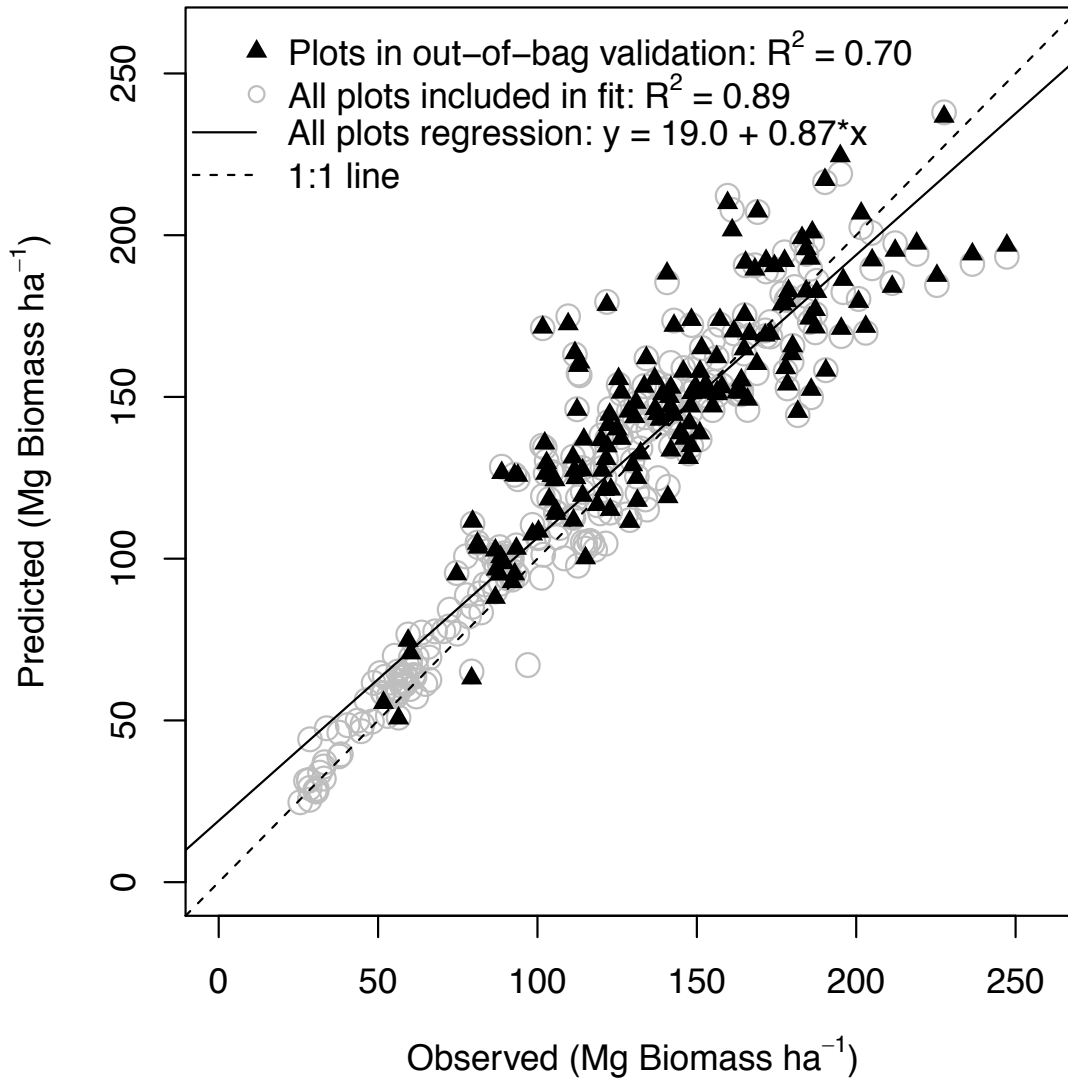
# Data Assimilation of Pine Plantation Ecosystem Research (**DAPPER**) System



# Distributions of parameters



# Model performance



# Example of partitioning uncertainty

Parameter uncertainty

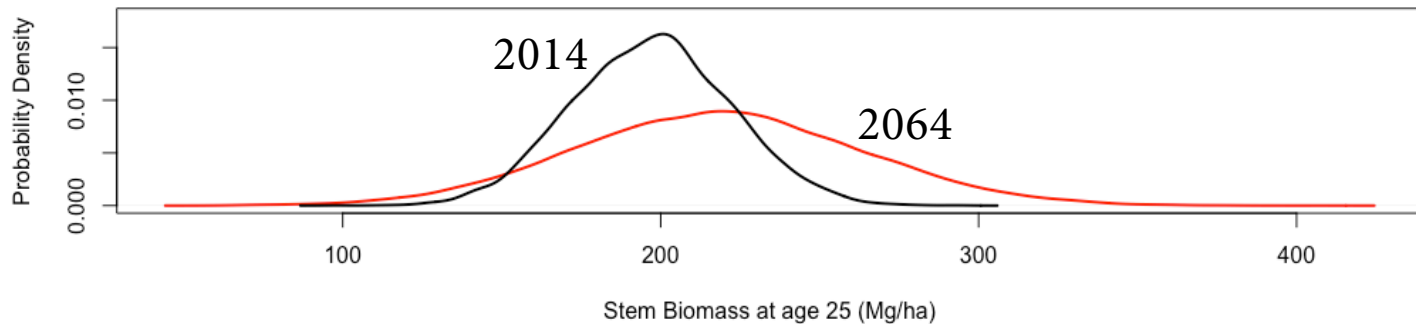
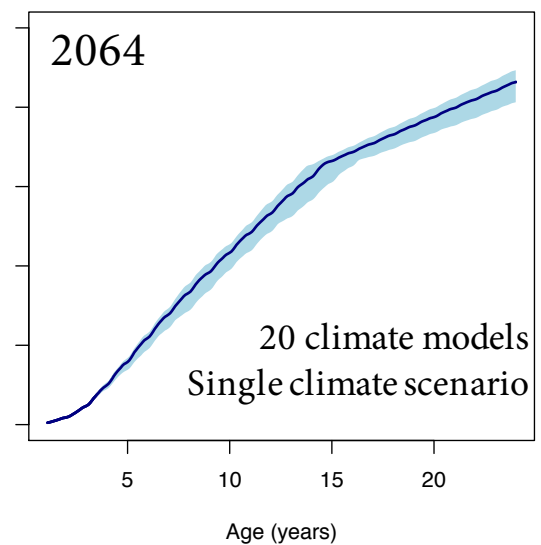
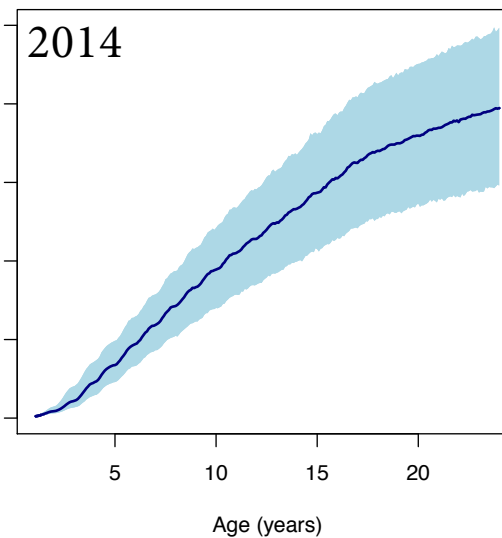
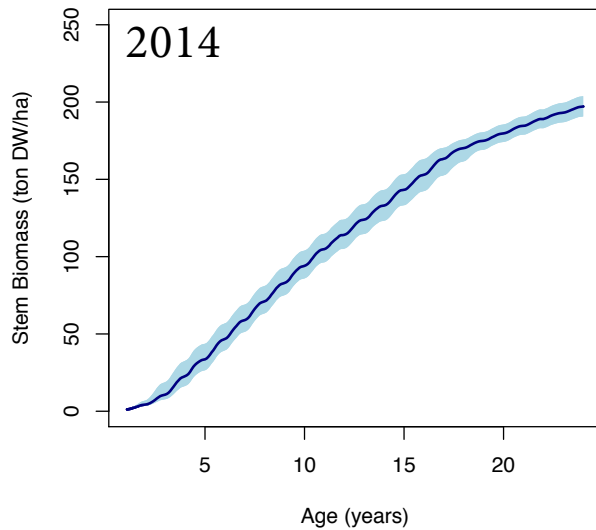
$$y = \mathbf{m}x + \mathbf{b} + \varepsilon$$

Model process uncertainty

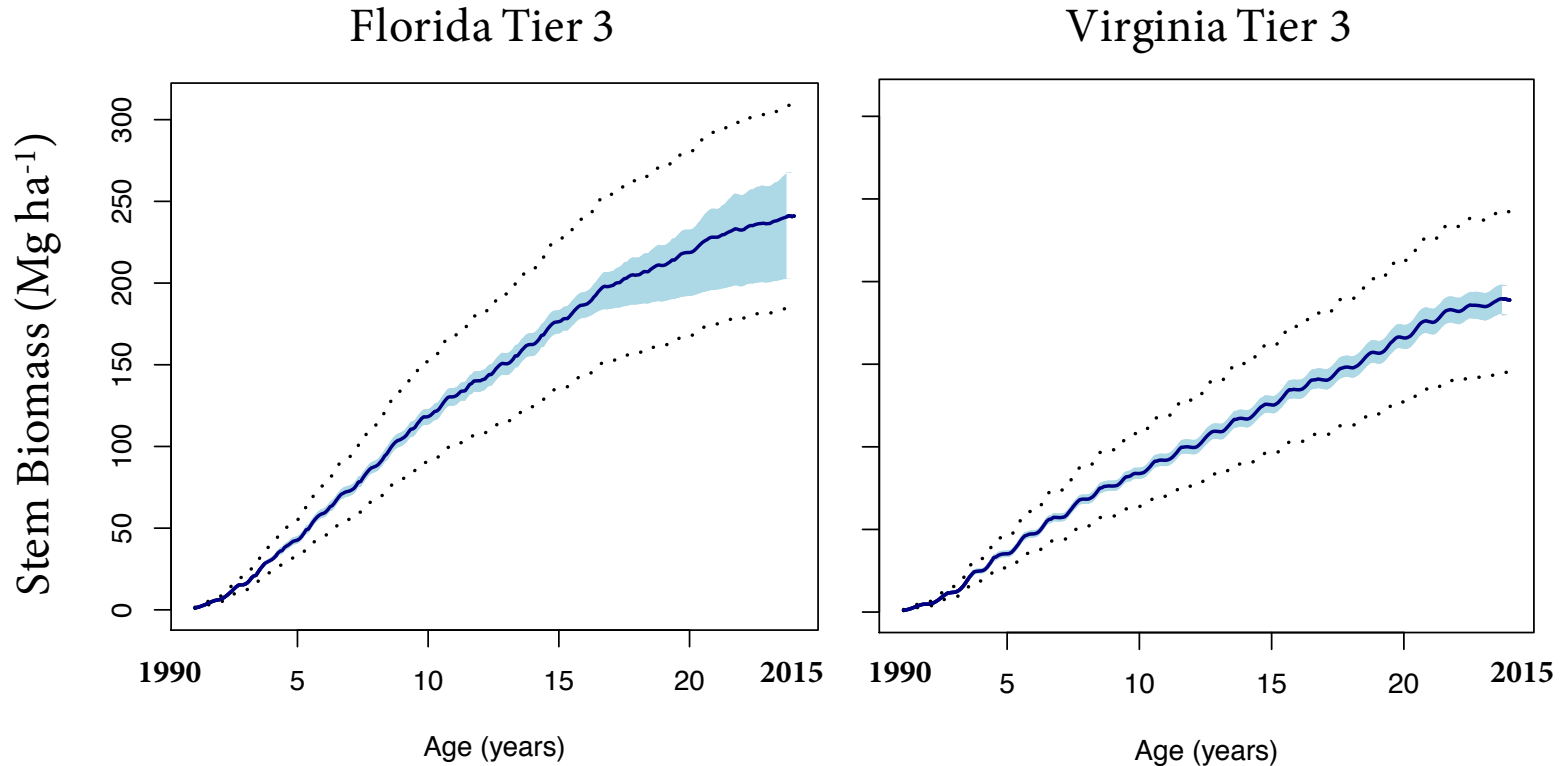
$$y = mx + b + \boldsymbol{\varepsilon}$$

Future climate uncertainty

$$y = \mathbf{m}x + \mathbf{b} + \varepsilon$$



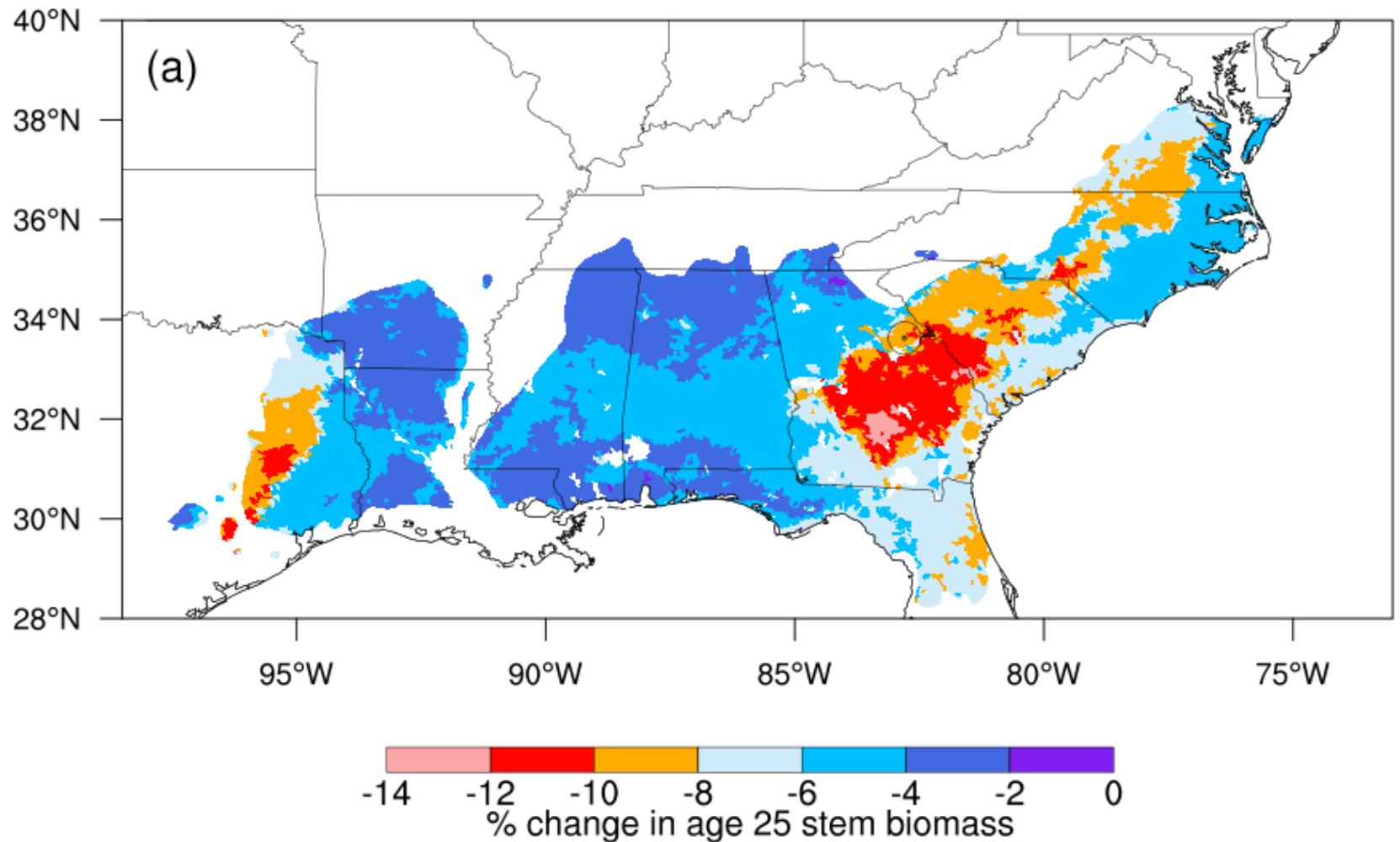
# Uncertainty estimation



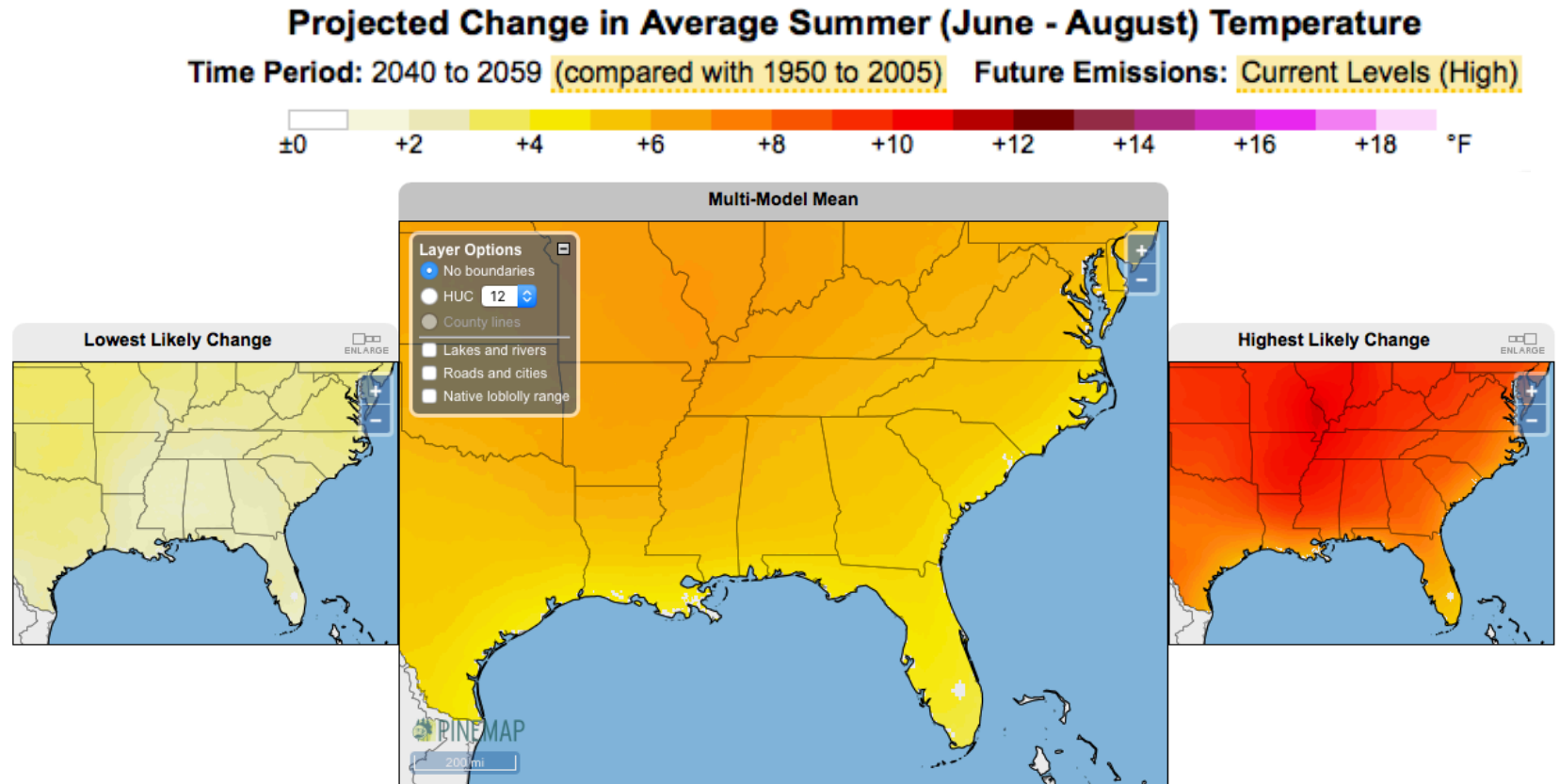
Dark line = median prediction  
Shaded = 95% C.I. on parameter uncertainty  
Dotted = 95% C.I. on total uncertainty

# Regional patterns in drought sensitivity

30% decrease in annual precipitation



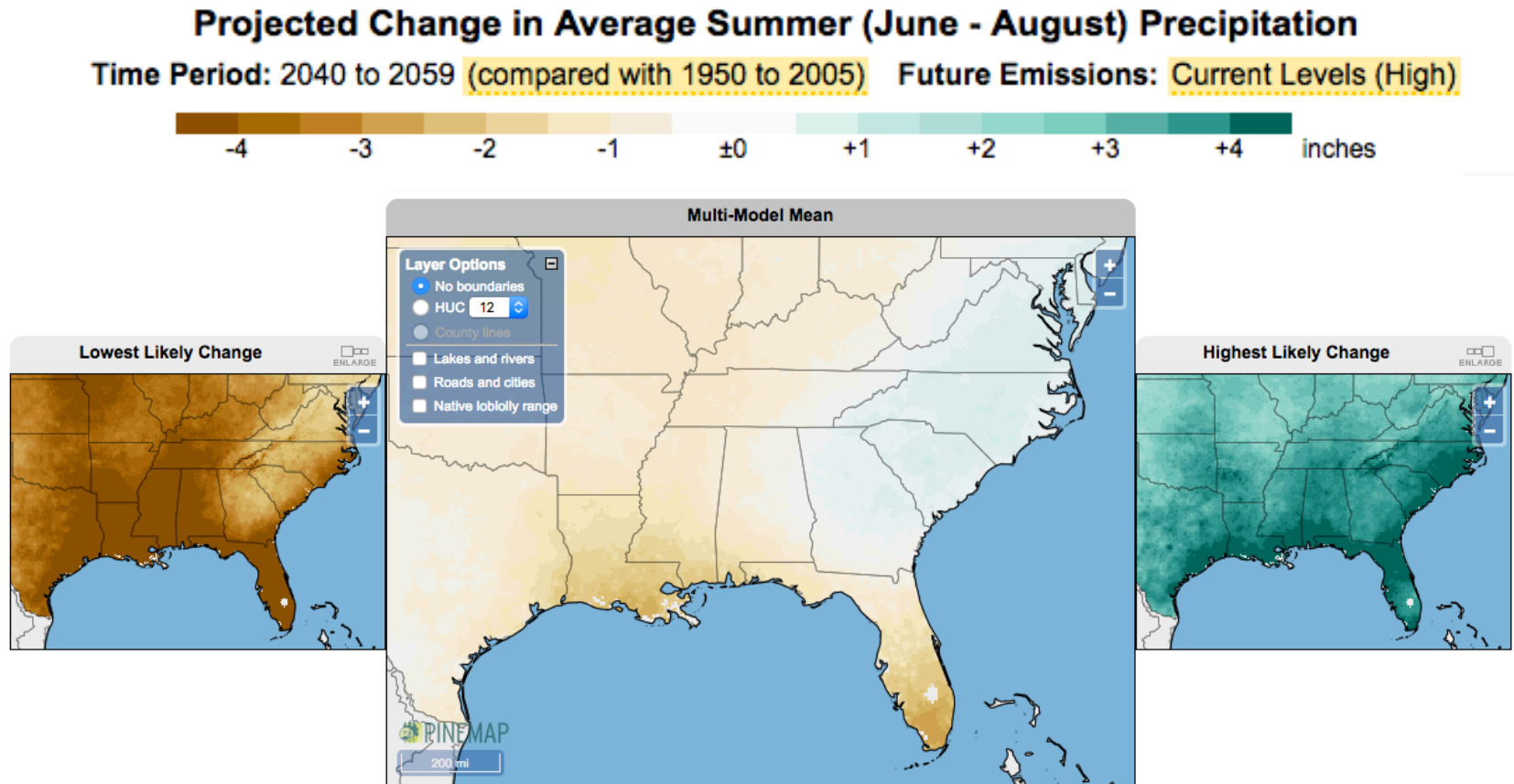
# Summer temperatures will be hotter



See PINEMAP Decision Support System

<http://climate.ncsu.edu/pinemap/index.php>

# Summer precipitation is uncertain



See PINEMAP Decision Support System  
<http://climate.ncsu.edu/pinemap/index.php>

# 3PG Results in DSS

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- Live demo of latest results from regional 3PG simulations in DSS