# LINKING NEON DATA AND BIOGEOCHEMICAL MODELS

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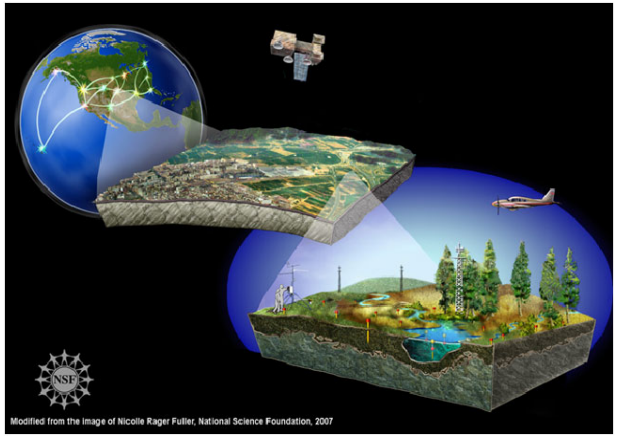
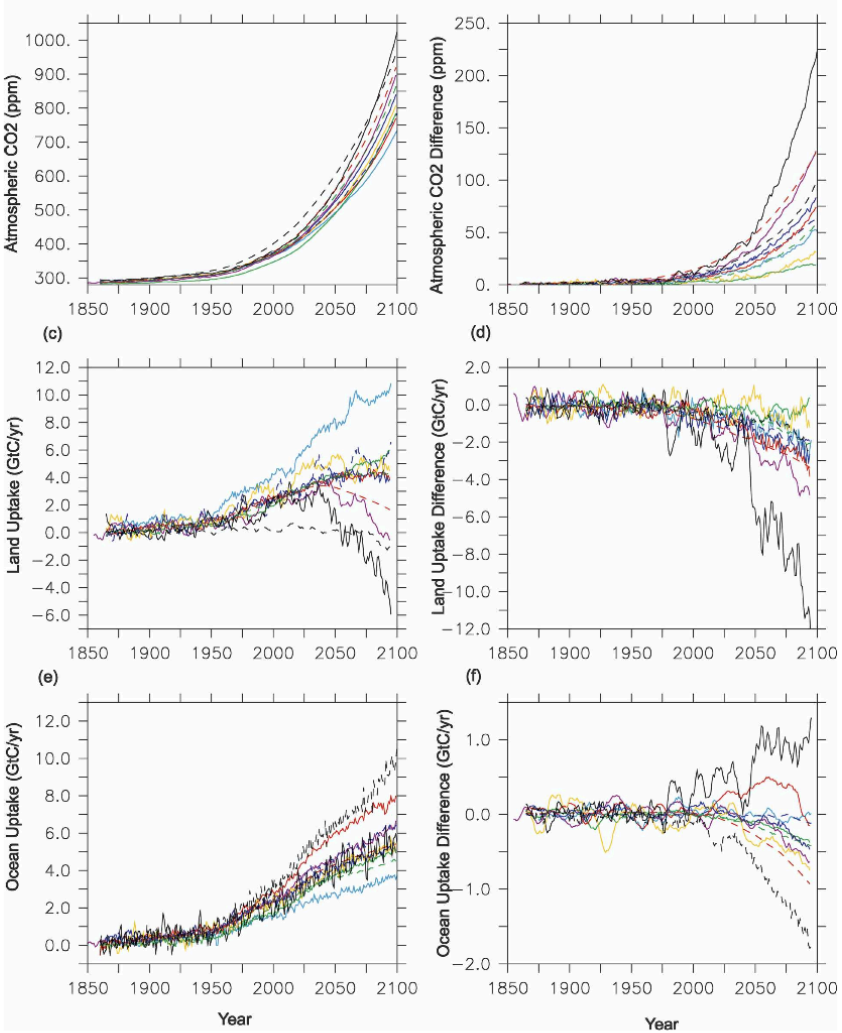


# Data are key

- This uncertainty stems from
  - i. **Structural uncertainty**
  - ii. **Parameter uncertainty**
  - iii. **Initial conditions uncertainty**
  - iv. **Boundary conditions uncertainty**




Friedlingstein et al., 2006

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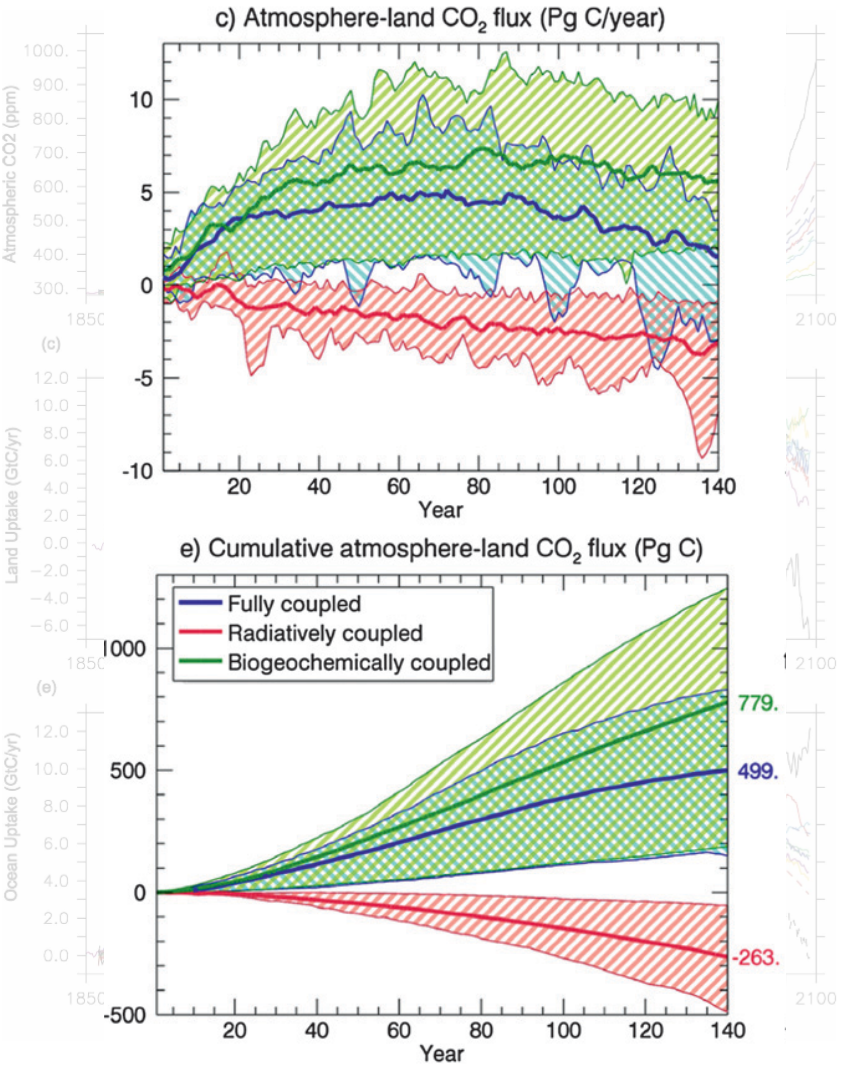


Arora et al., 2013

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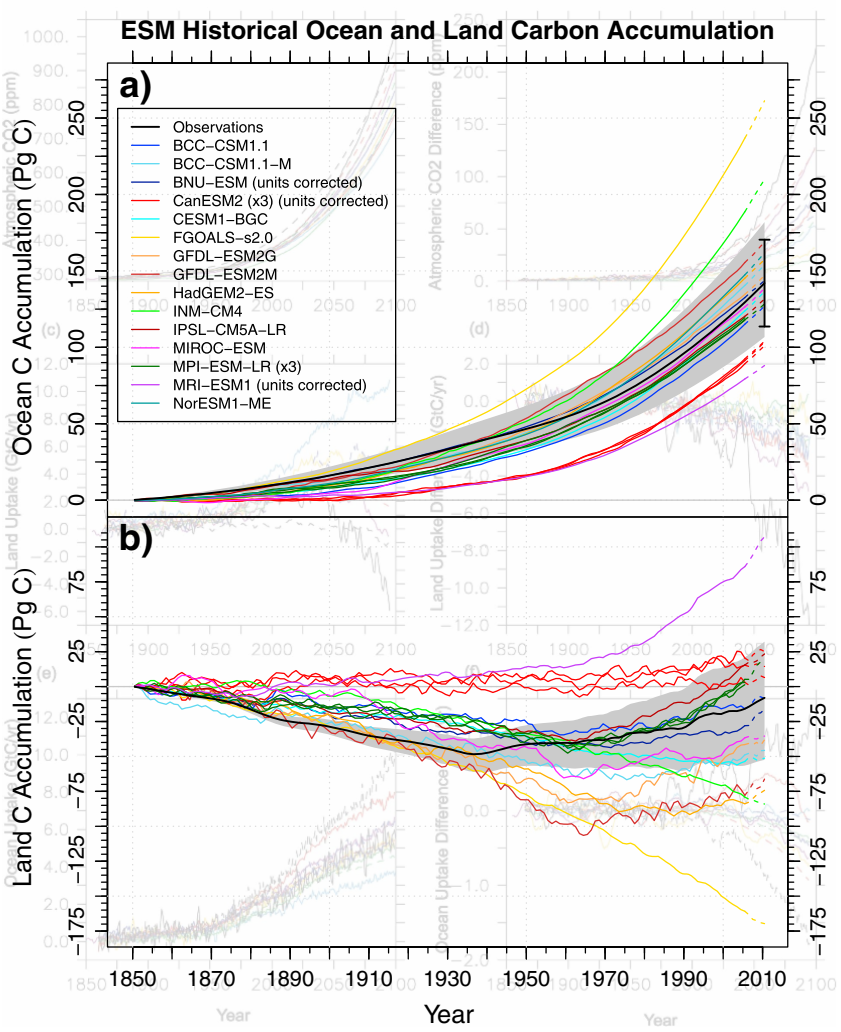


Hoffman et al, 2013

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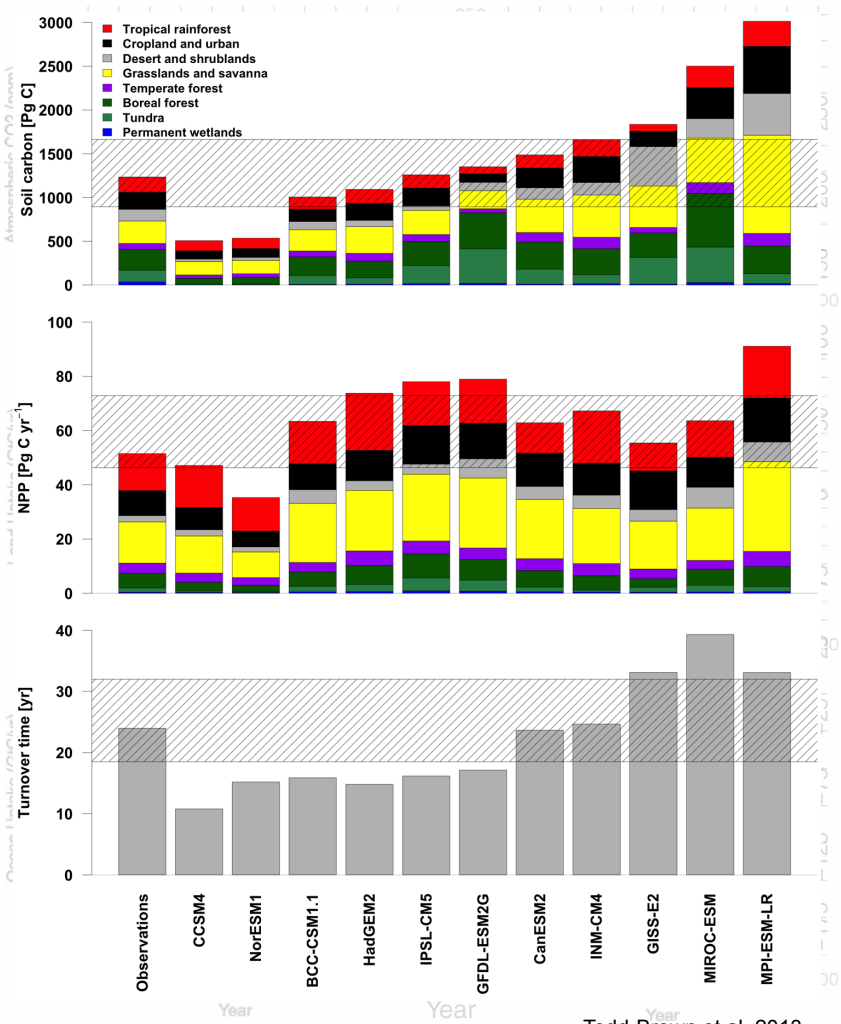


Todd-Brown et al, 2013

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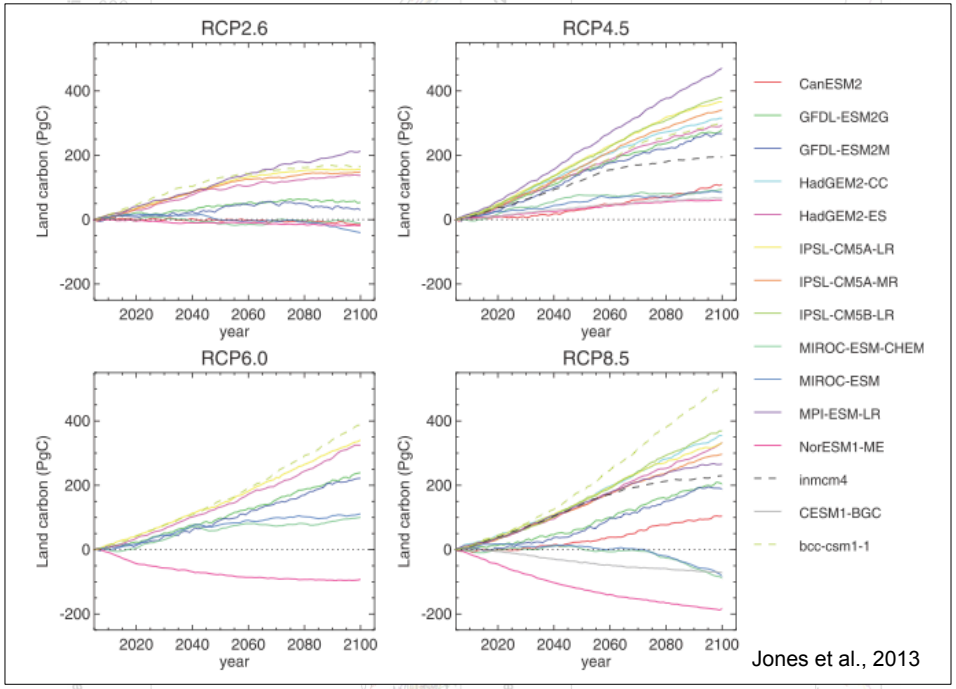
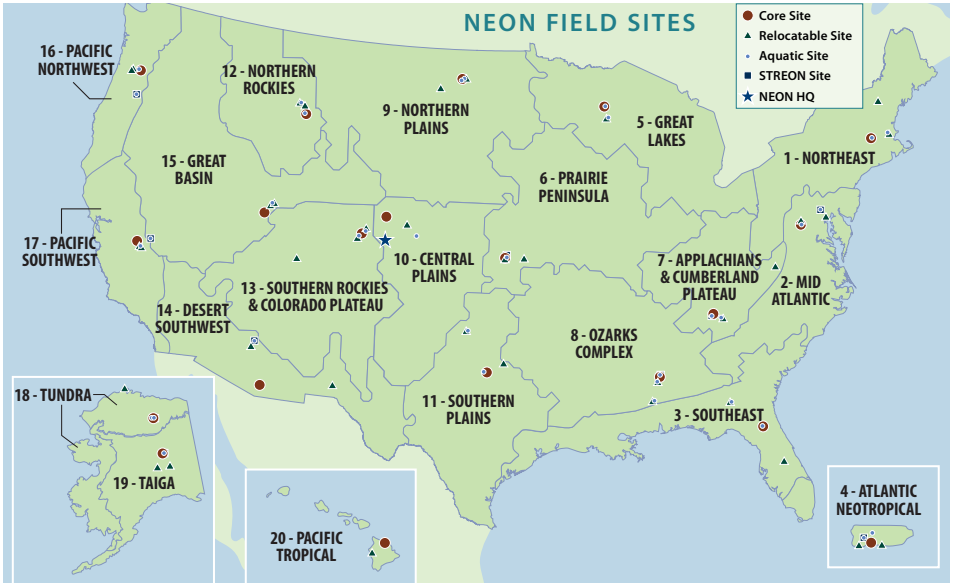
- Need to find (new) ways to use (new) observations to:
  - Evaluate
  - Benchmark
  - Constrain
  - Assimilate



Jones et al., 2013

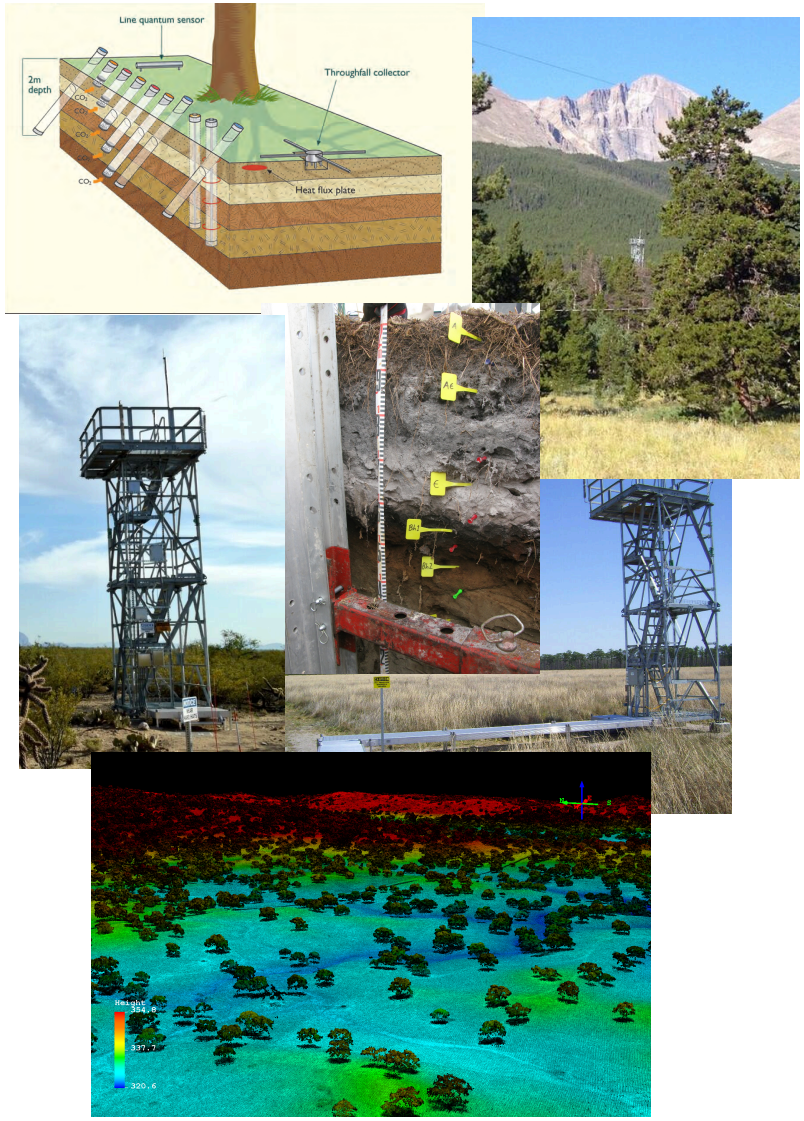
# National Ecological Observatory Network

- Collect and openly distribute data on the drivers of and responses to ecological change
- Continental scope and 30-year time horizon
- Standardized methods of data collection, high investment in QA/QC, and calibration

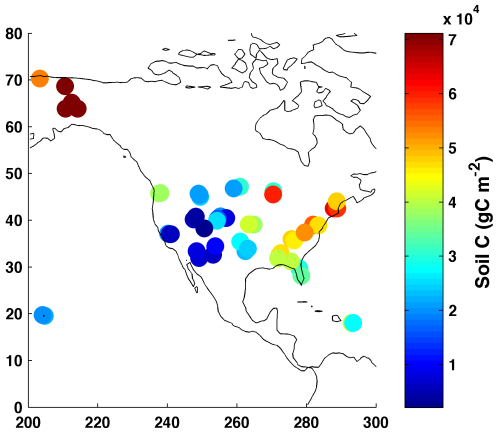


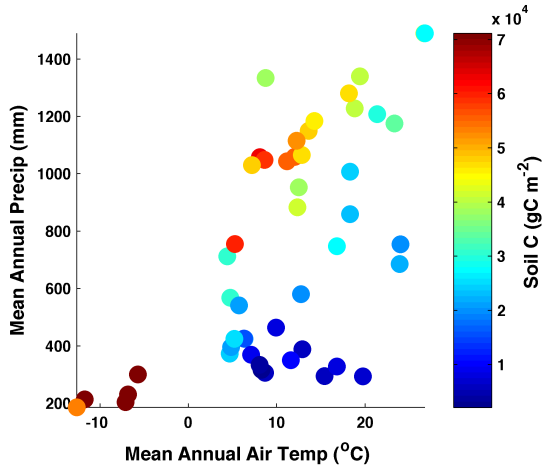
# Biogeochemistry Observations

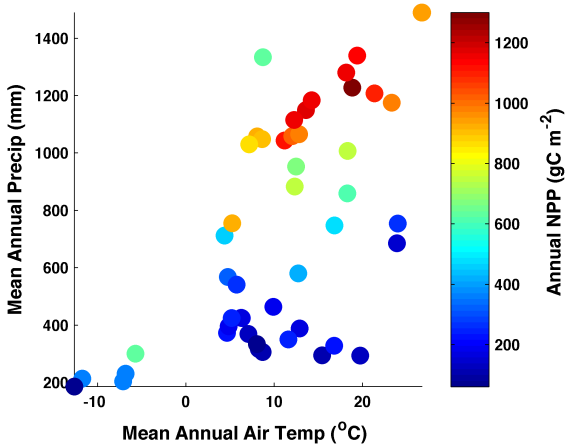
- Many relevant observations; Some standard, some less common
  - Eddy covariance fluxes of energy, water and carbon
  - Profiles of soil temperature and moisture, and soil respiration
  - NPP, litterfall and fine root turnover from minirhizotrons
  - $NO_y$ and Ozone deposition
  - Profiles of $CO_2$ and $H_2O$ vapor isotopes
  - Soil microbial biomass, diversity & functional composition
  - Lidar and hyperspectral derived biomass, leaf area and canopy chemistry at <1m resolution over 100s $km^2$

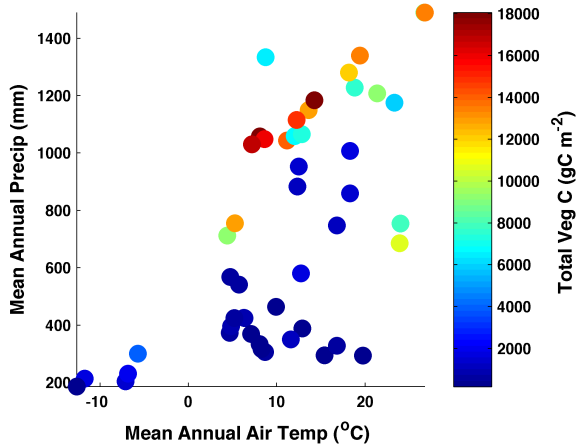


# NEON in CLM-space

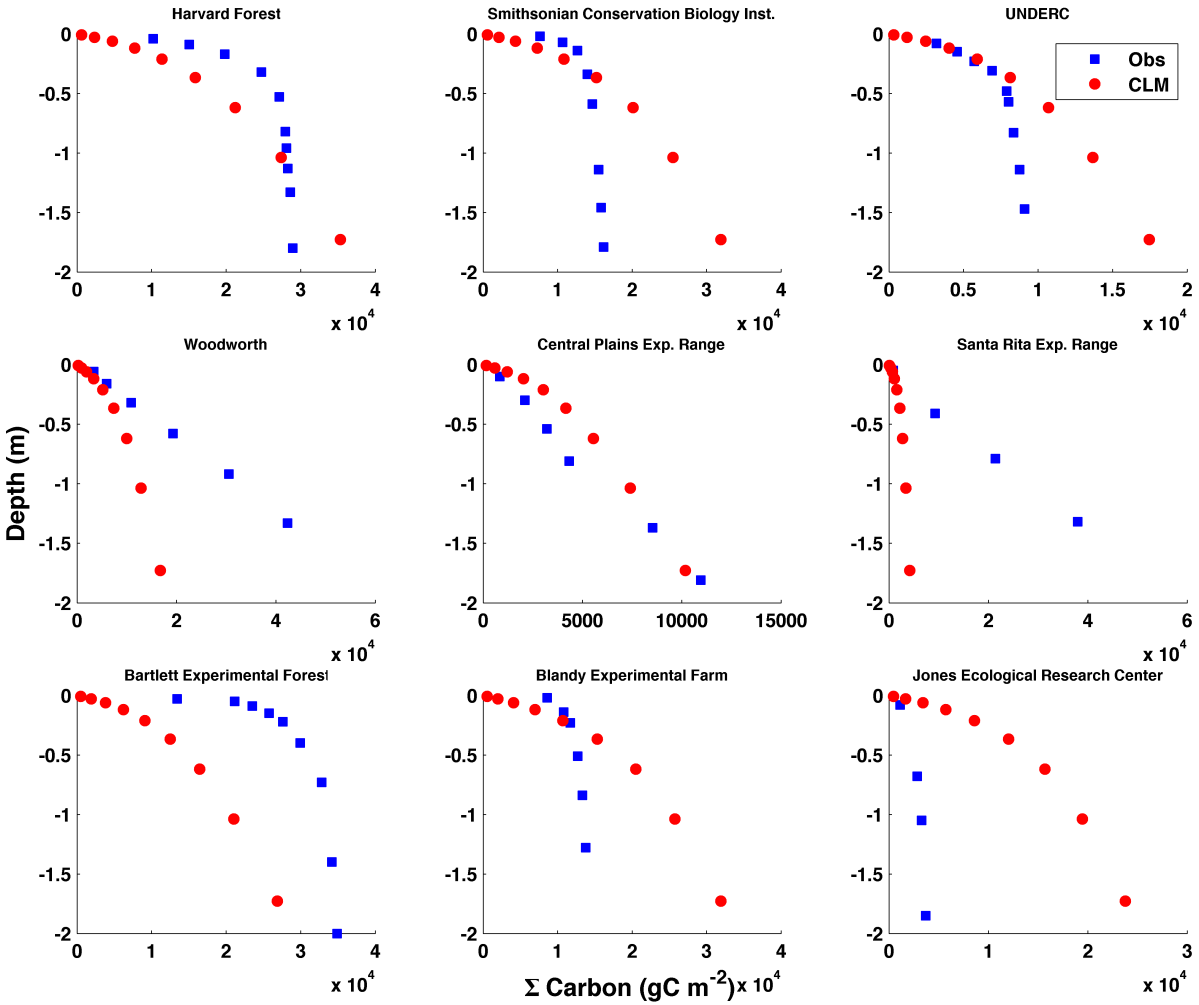


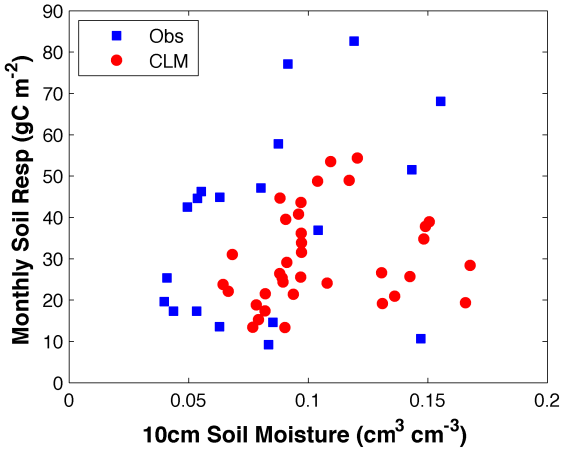



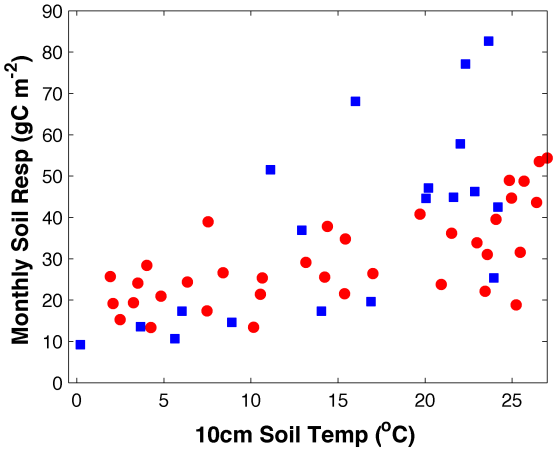



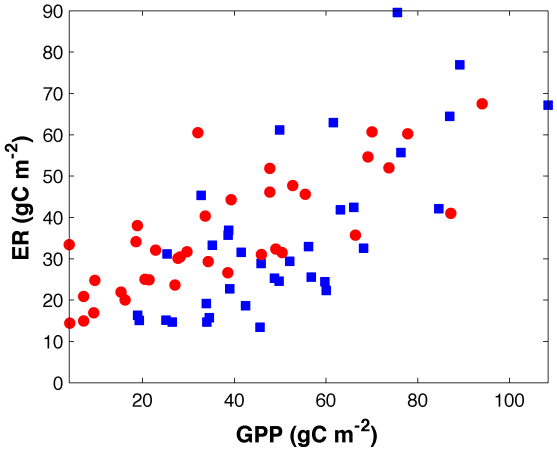
# Direct comparison

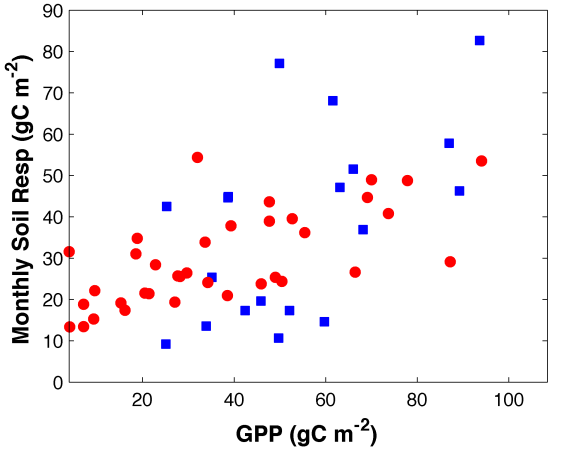


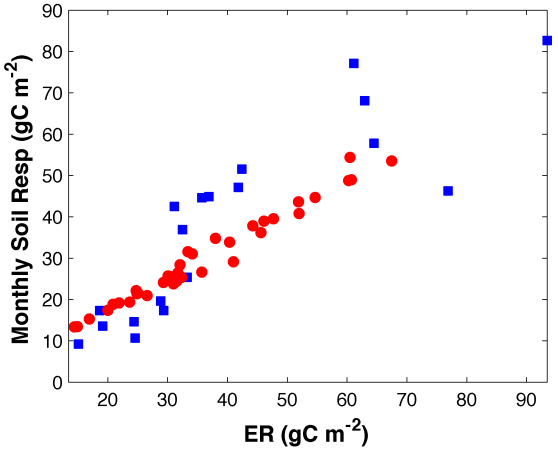
# Functional responses

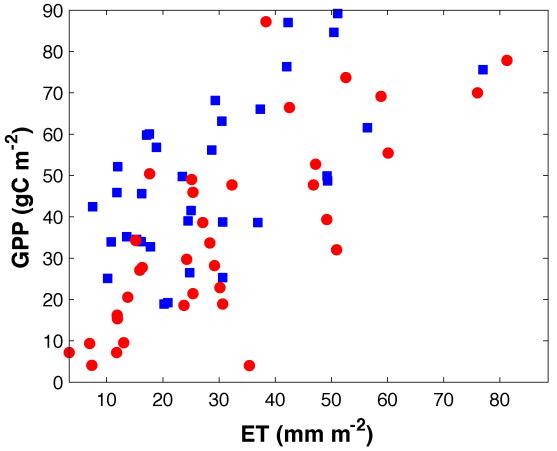


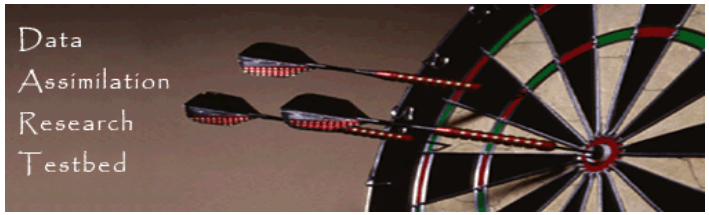



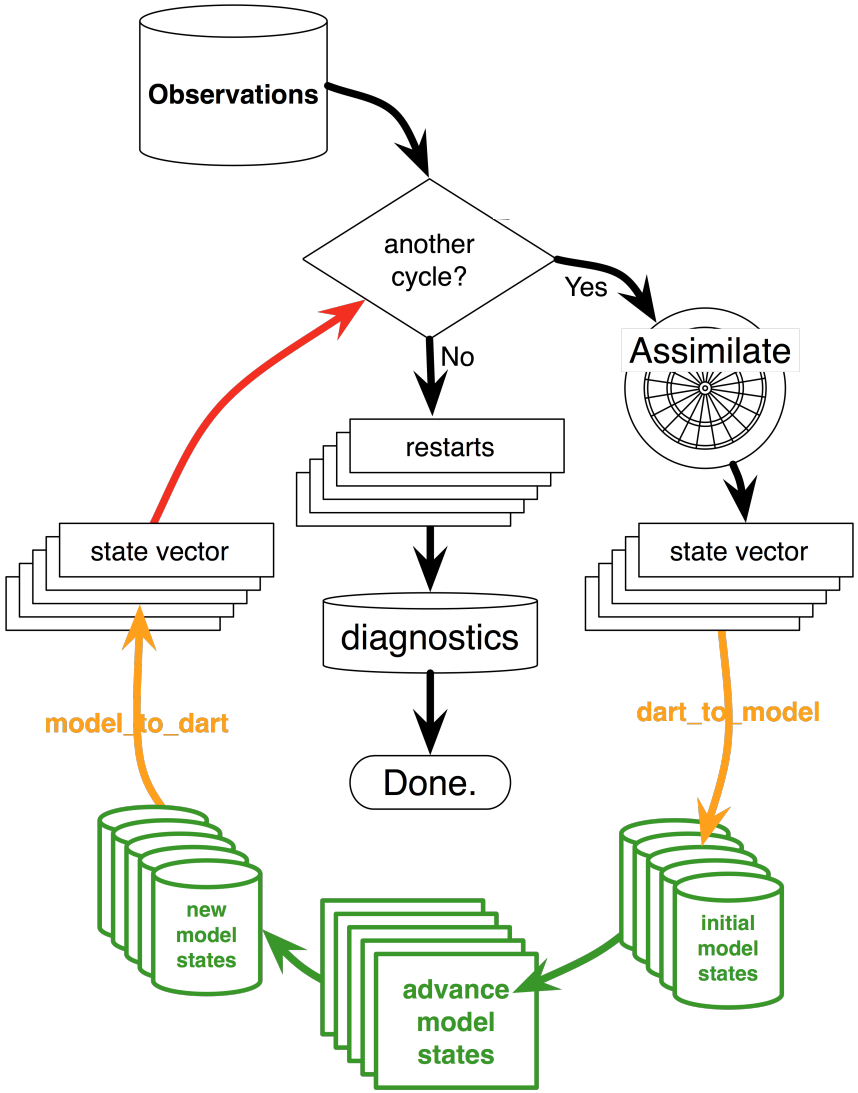



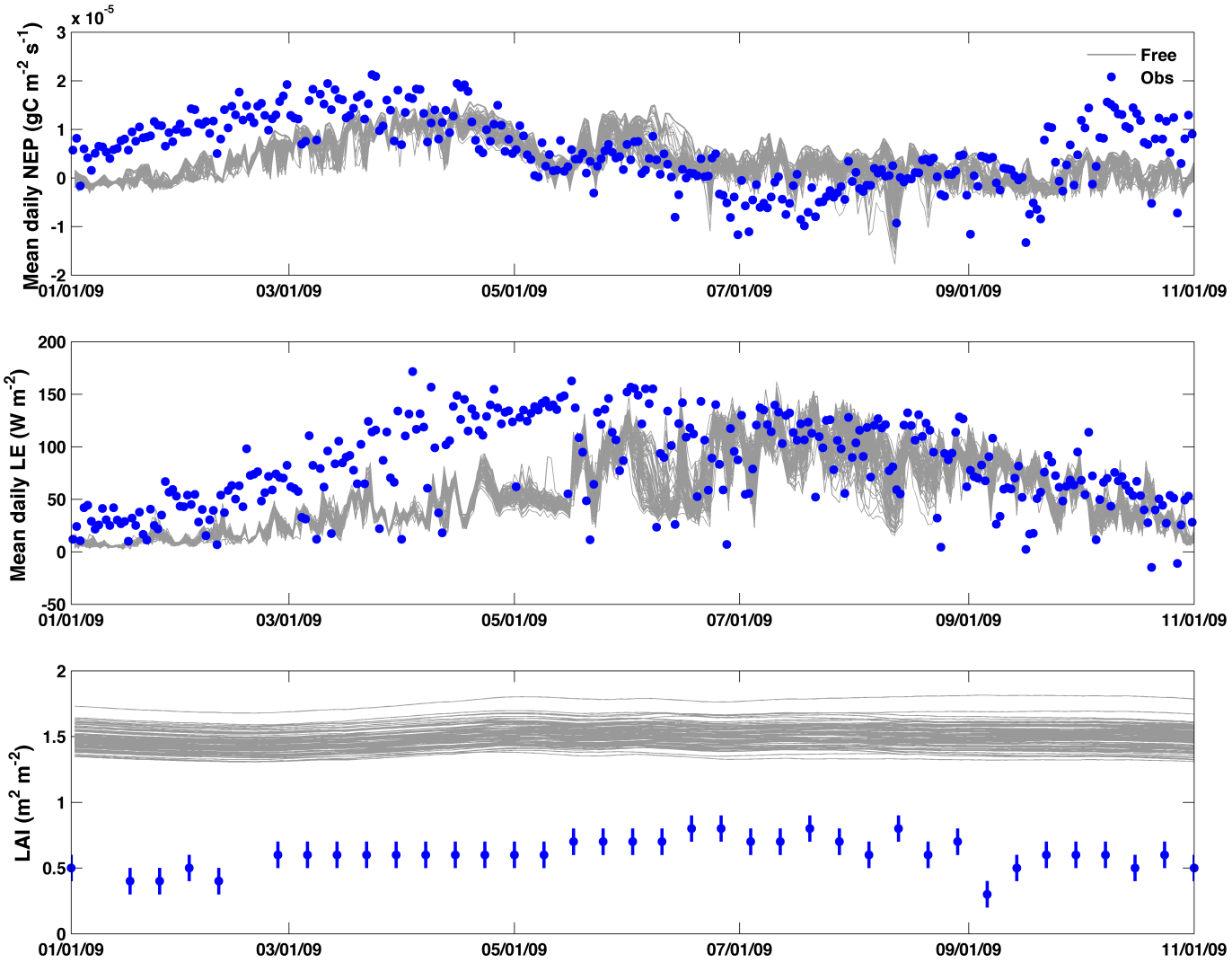
# Data Assimilation Research Testbed (DART)

- DART is a community facility for ensemble DA
- Uses a variety of flavors of filters
  - Ensemble Adjustment Kalman Filter
- Many enhancements to basic filtering algorithms
  - Adaptive inflation
  - Localization
- Uses new multi-instance capability within CESM



# Ameriflux and MODIS LAI observations



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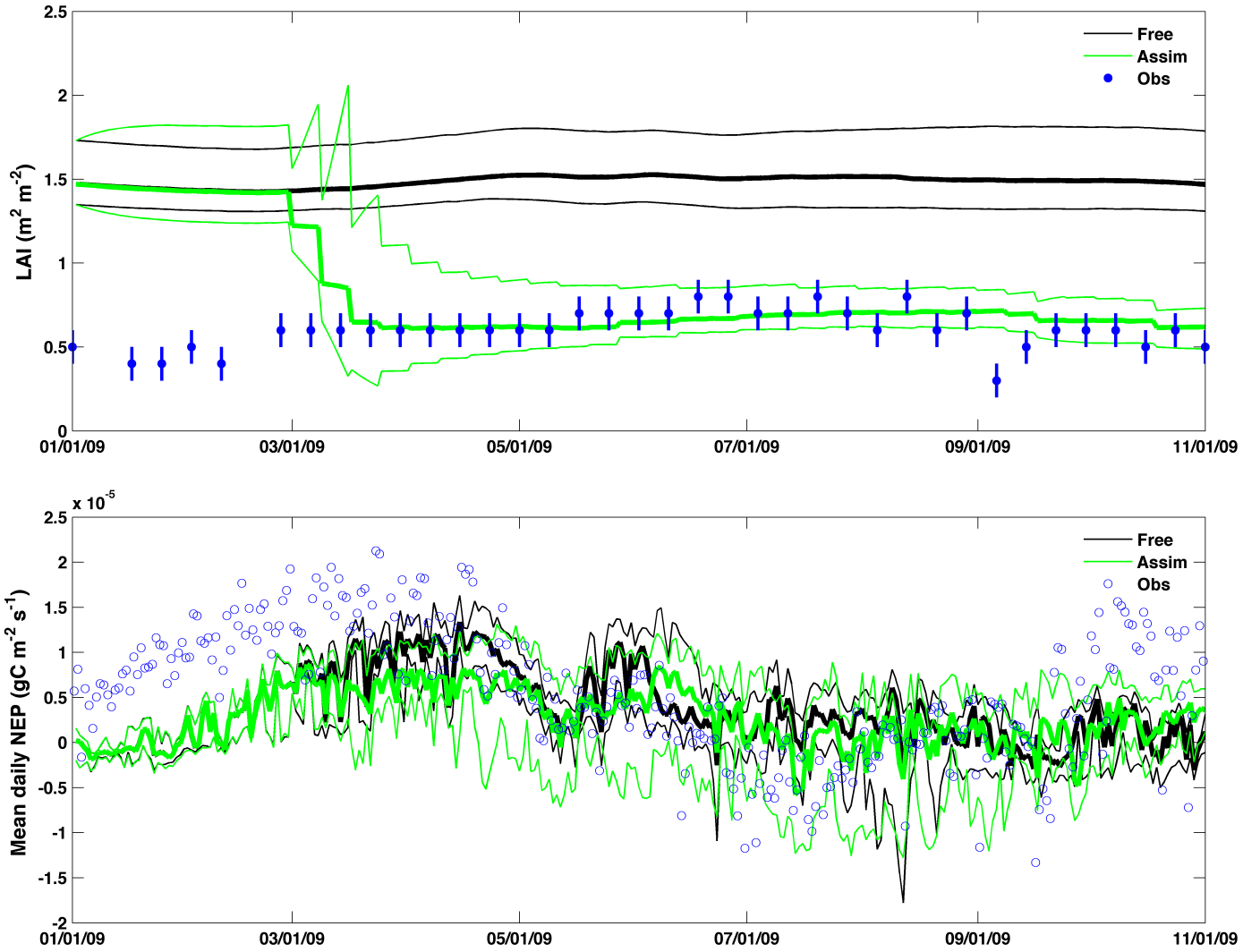

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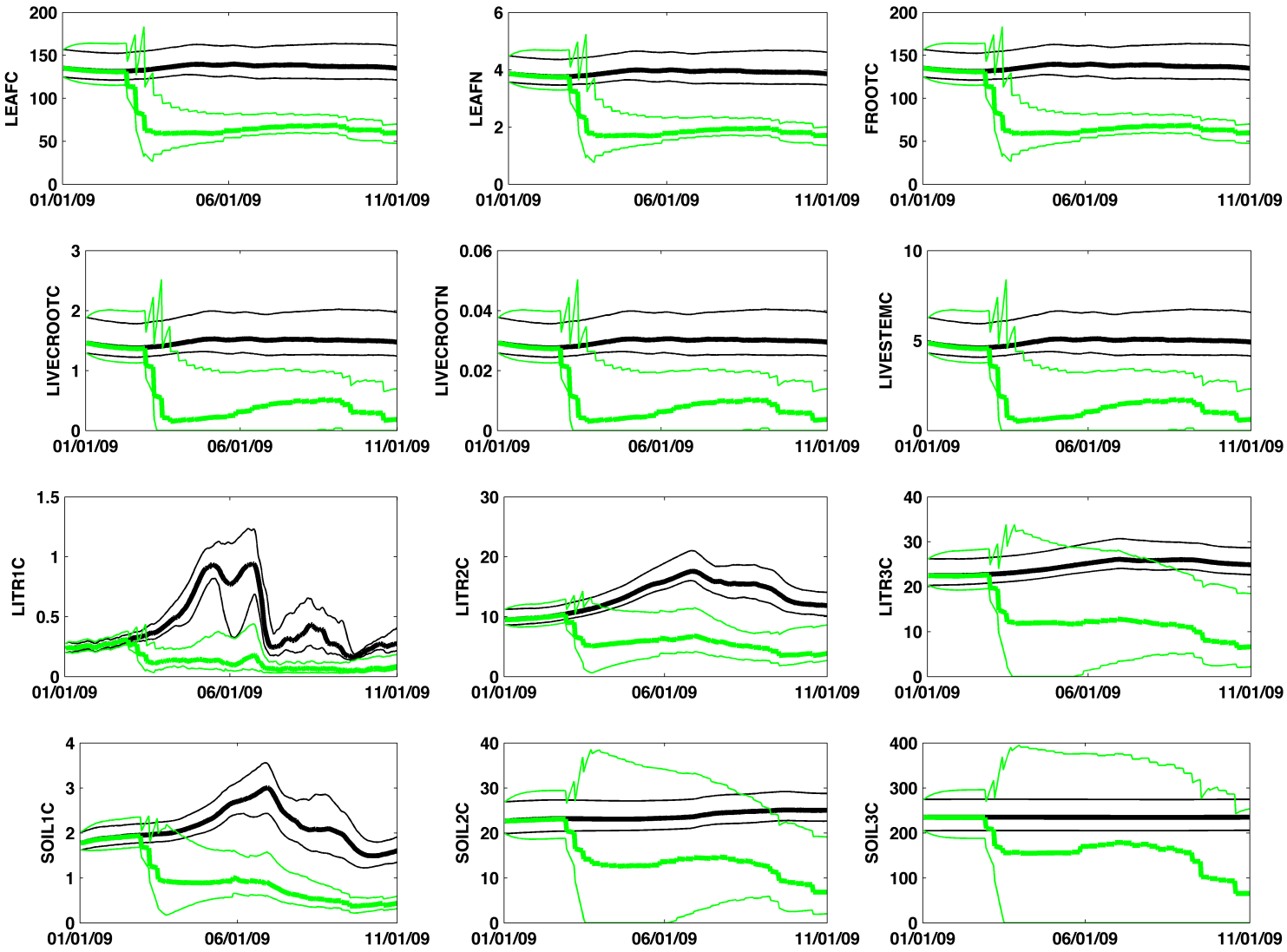

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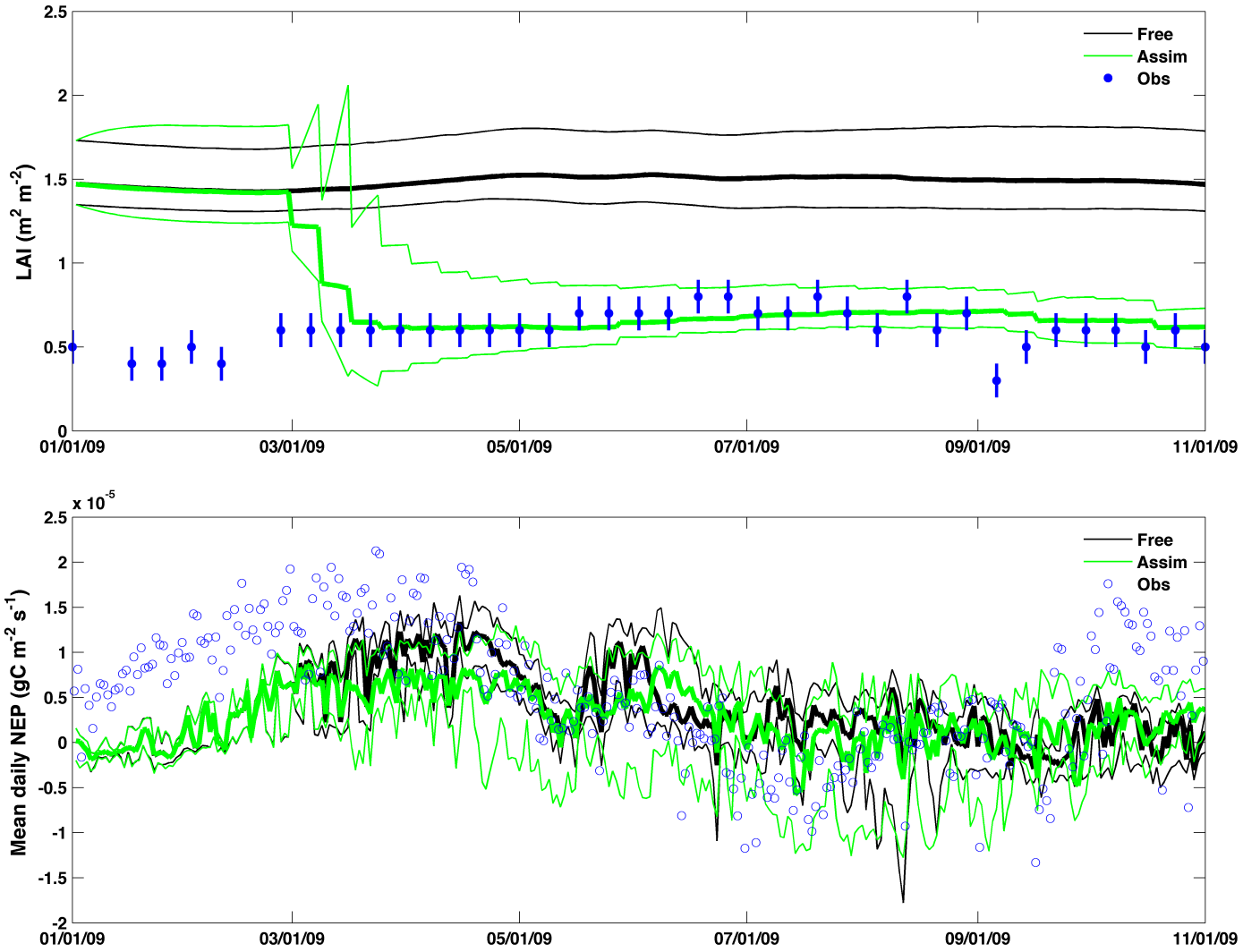

# Current Directions

- CLM-DART development
  - Investigating improved methodology for using flux tower observations in this framework
  - Adding plant functional types to observation meta-data
  - Adding additional, site specific observation types

- Upscaling NEON observations – PDF of fluxes and assessing representativeness error

- **Optimizing NEON data delivery for model evaluation – please let me know if you have ideas**