Topic 2 – Break Out Summary

Fluxes, (Hyper)Spectral Remote Sensing and Models

Large Scale Models

Variance, Uncertainty, & Data Products

- Focused on three main topics
  - Disturbance
    - Variability arising from ecosystem and human causes
  - Interannual variability and anomalies
    - Variability arising from
  - Uncertainty
    - Characterization and quantification of errors
  - Data
    - What are we missing

Disturbance

- Disturbance not well represented in models
  - Define disturbance as natural component of ecosystems instead of stochastic events
  - Networks, and remote sensing do not capture longer time scale processes (e.g., processes with 30-50 year return periods)
  - Need flux tower chronosequences in much larger set ecosystem types
  - Character/severity of disturbance matters
- Much effort in remote sensing towards developing data sets
  - Fire, insect outbreaks – lots of disagreement across products
- Mismatch between what remote sensing can/is providing and what models need
- To most effectively link carbon/water consequences of disturbances fluxnet/modeling community needs to define and communicate needs to remote sensing community

Interannual Variation and Anomalies

- Interannual variability is hard to capture

  - Low variance hard to explain

- Opportunity to evaluate capacity of models and remote sensing to capture dynamics by focusing on big events/anomalies

  - Low hanging fruit to help understand what we can and cannot detect and model

- Interannual variability/Event-based analysis

  - Hydrologic anomaly in 2011; European heat wave 2003/2010; Amazonian droughts

  - Need better information/understanding of drivers, particularly lagged or cumulative effects

- Remote sensing of phenological anomalies and changes in seasonality

  - Exploit information at site level from webcams (Andrew, Lisa)

Uncertainty (in models and data)

- Characterization of uncertainty is difficult
  - Multiple sources of error propagate through model results
    - Structural error, calibration error, forcing error, representation error (sampling uncertainty) – Enting et al.
    - Errors in met drivers and remote sensing inputs used for large scale models need more attention
- Gaps in sampling
  - Geography matters (but what can you do about it?)
  - How can we think about more effective sampling
    - Biogeographic stratification; clustering of remote sensing/ecoregions, etc
    - Stratification based on spatio-temporal variation in model outputs
- Need community discussion of how to characterize and quantify sources and magnitudes of uncertainty; uncertainty products

Data Products

- MODIS subsetting tool at ORNL DAAC provides model to apply other remote sensing data sets at fluxnet sites
  - One stop shopping is good (DAAC, NEX)
- Preliminary wish-list includes
  - Field measured ecophysiological variables used by models (e.g., V_{max})
  - Medium spatial resolution (10-50 m) maps of model PFTs at fluxnet sites
  - Landsat archive (time series in support of for e.g., disturbance histories)
  - Hi-Res Data (<1m) for upscaling (Quickbird, etc)
  - LIDAR: DESDynI is on hold, but still opportunies from airborne
  - Hyperspectral (AVIRIS,Hyperion)
    - Need to lower barriers to access
  - Probably many others
- Remotely sensed PAR