Flux Data Assimilation, Coherence Analysis and Ecosystem Model Structure Evaluation: Plans for Upcoming Research at PSU

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with help from

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The Big Questions

1. What are the CO$_2$ fluxes from North America?
2. What processes drive CO$_2$ flux variability?
3. How will CO$_2$ fluxes behave in the future?
Areas of need (I)

Time Scale

- Year
- Month
- Day
- Hour

Spatial Scale

- \((1\text{m})^2 = 10^4\text{ha}\)
- \((1\text{km})^2 = 10^2\text{ha}\)
- \((10\text{km})^2 = 10^4\text{ha}\)
- \((100\text{km})^2 = 10^6\text{ha}\)
- \((1000\text{km})^2 = 10^8\text{ha}\)

Forest inventory

Inverse study

Downscaling

Upscaling

Chamber flux

Tower flux

Airborne flux

R_{earth}
Areas of need (II)

What drives interannual variability in NEE?

Fig. 4-9, Ricciuto (2006)
Areas of need (III)

What will CO$_2$ fluxes look like in 100 years?

Fig. 1c, Friedlingstein et al. (2006)
Q1: What is the CO$_2$ flux from N. America?

How much information does a flux tower provide?
Q1: What is the CO$_2$ flux from N. America?

How best to harness the available data?
Q2: What processes drive CO$_2$ flux variability?

Are intra-site processes or extra-site processes more important?

Fig. 4-10, Ricciuto (2006)
Q3: How will CO$_2$ fluxes behave in the future?

Can ecosystem models help to quantify uncertainties?

Fig. 3-5, Ricciuto (2006)
Conclusions (ongoing research efforts)

More analysis of ecosystem model residuals may help to quantify CO$_2$ flux spatial coherence.

Analyses are under way to indentify ecosystem model structural problems.

Model parameter PDFs will allow probabilistic future CO$_2$ flux projections.
References
