Site-Level Interim Synthesis Update

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Site-level synthesis: Objectives

- Starting at the spatial scale of individual sites, establish quantitative framework that allows NACP investigators to answer the question:
  - **“Are the various measurement and modeling estimates of carbon fluxes consistent with each other - and if not, why?”**
- Improve quantification of uncertainty for forward models and site-based measurements.
- Identify strengths and weaknesses in models and measurements.
- Migrate new knowledge up-scale in coordination with regional and continental-scale efforts.

Site-level MDC: Approach

- Anchor the comparison at AmeriFlux sites
  - Multiple years of energy, water and carbon fluxes
  - Ancillary physical and biological measurements ("template" exists, encourage site PIs to fill it in)
  - Initial selection of 25-30 potential sites
- Introduce data from inventories as available.
- Measurement teams produce their own best estimates of fluxes and flux uncertainty at each site.
  - Standardized filtering and gap-filling.
  - Standardized approach to uncertainty estimates
    - Random error
    - Systematic error (e.g. due to instrumentation, advection, data filtering, gap-filling)

Site-level MDC: Approach (cont.)

- Modeling teams produce their own best estimates of fluxes and flux uncertainty at each site for each model.
  - Protocol specifies model inputs and provides goals and examples for obtaining model uncertainty.
  - Each group can tackle the uncertainty problem however they see fit and are best able.
  - Groups encouraged to categorize multiple sources of uncertainty, for example due to:
    - Parameter estimation
    - Model structure and/or process representation
    - Initial / boundary conditions (e.g. representation of disturbance history, veg type, or diagnostic LAI)
    - Surface weather drivers
  - Each model has unique characteristics, and each modeling team has unique capabilities – avoid over-specifying the model uncertainty approach.

Site-level MDC: Approach (cont.)

- Measurement – modeling synthesis
  - Multiple teams will tackle several aspects of model-data comparison in parallel.
  - Protocol includes some example statistical tests that can incorporate the measured and modeled fluxes and their uncertainties to determine if they are consistent.
  - Teams will have flexibility to introduce additional statistical methods in the analysis, as needed.
  - Evaluation at multiple time scales:
    - Multi-year annual mean
    - Interannual variability
    - Seasonal
    - Synoptic
    - Diurnal
  - Workshop to initiate analysis

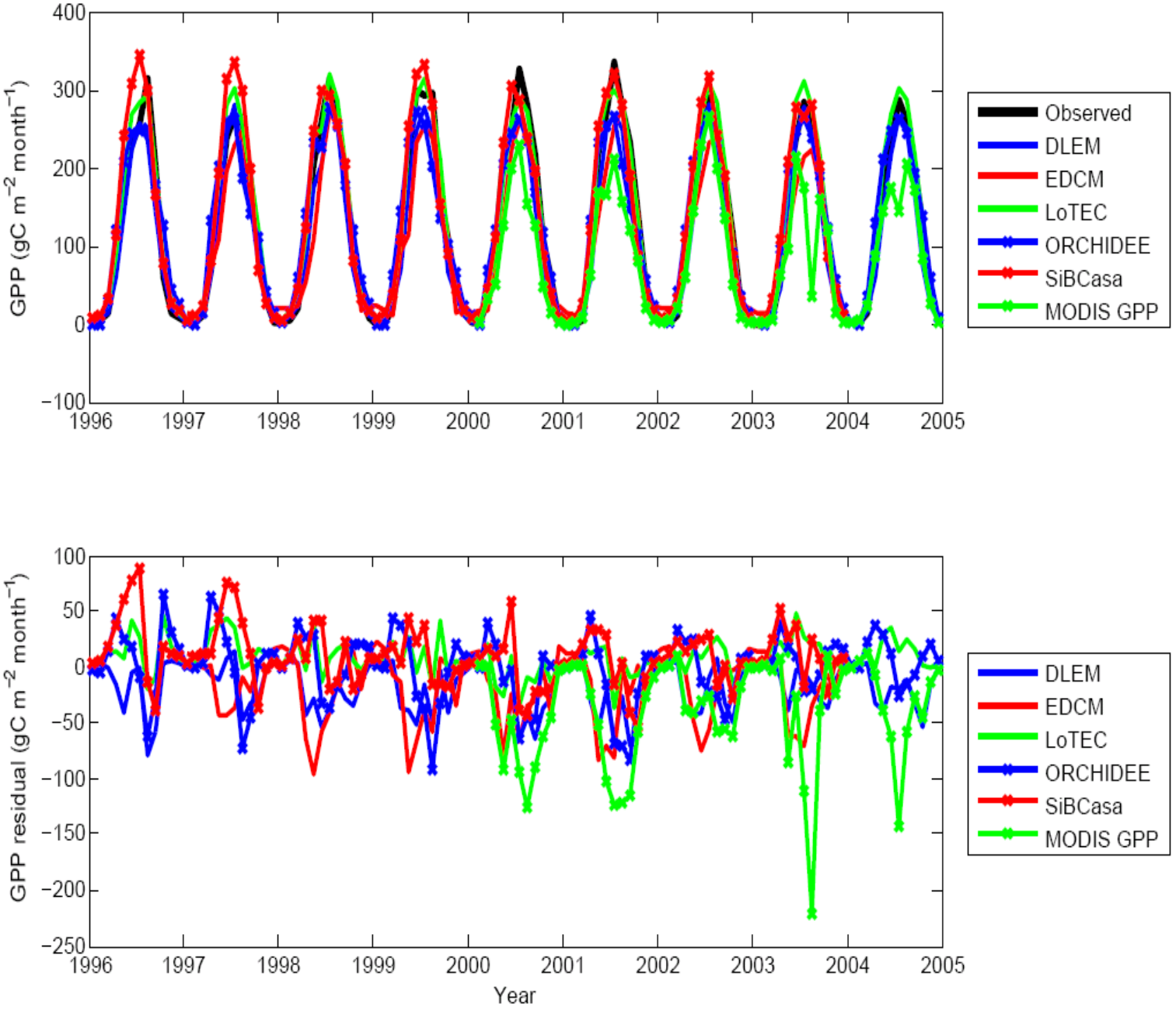
Progress report

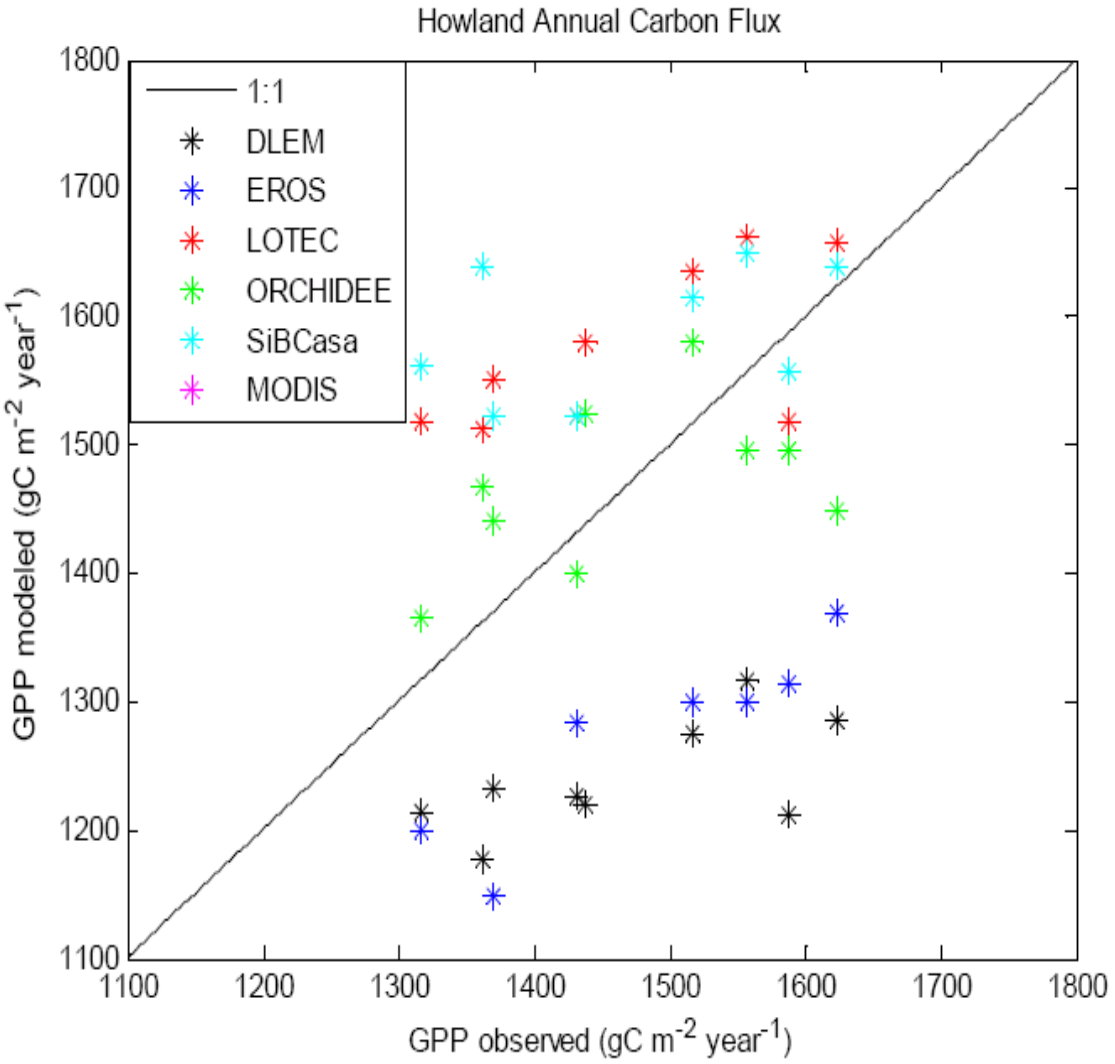
- Preliminary site list compiled (~35 sites)
- Agreement from all site PIs to either actively participate in synthesis or to provide data
  - Collaboration with Canadian Carbon Program approved by its Board of Directors (as of 14 Aug 2008).
- Gap-filled flux data and surface weather data now available for all site-years
- ~70 participants, ~15 models, substantial overlap with regional synthesis group

Progress report (cont'd)

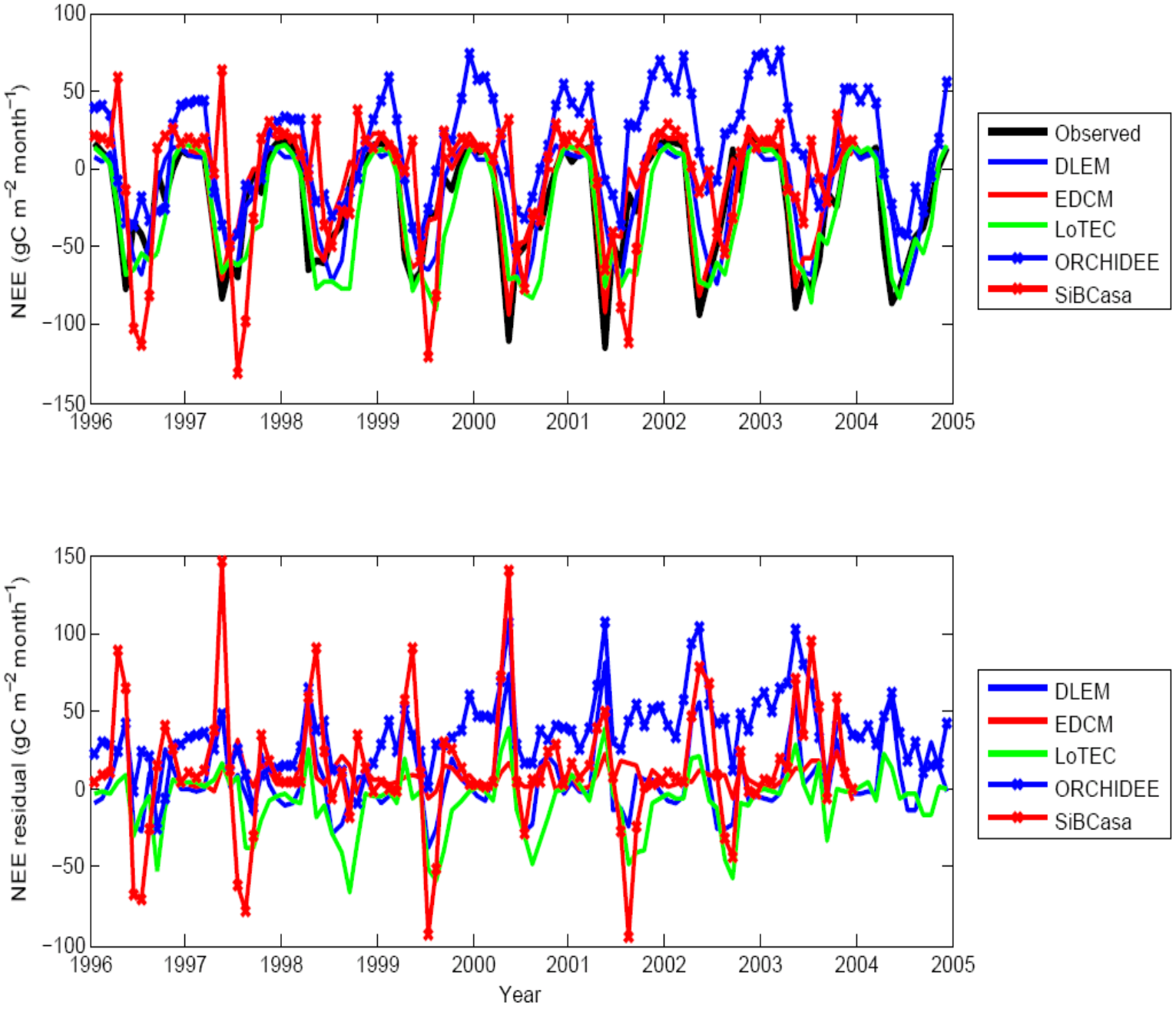
- Subset of models have been run for Howland site as preliminary test of protocol.

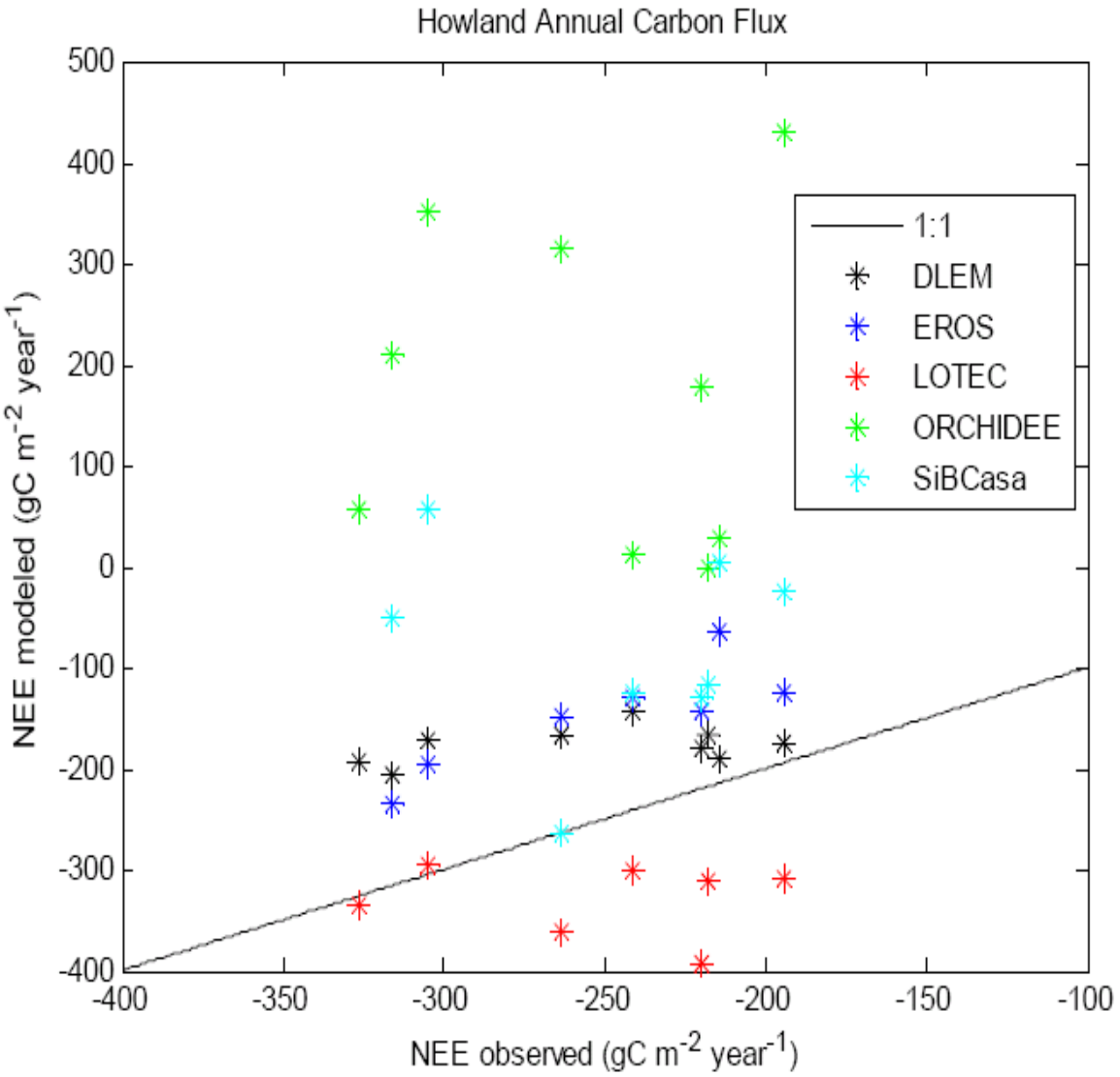
Howland: GPP comparison



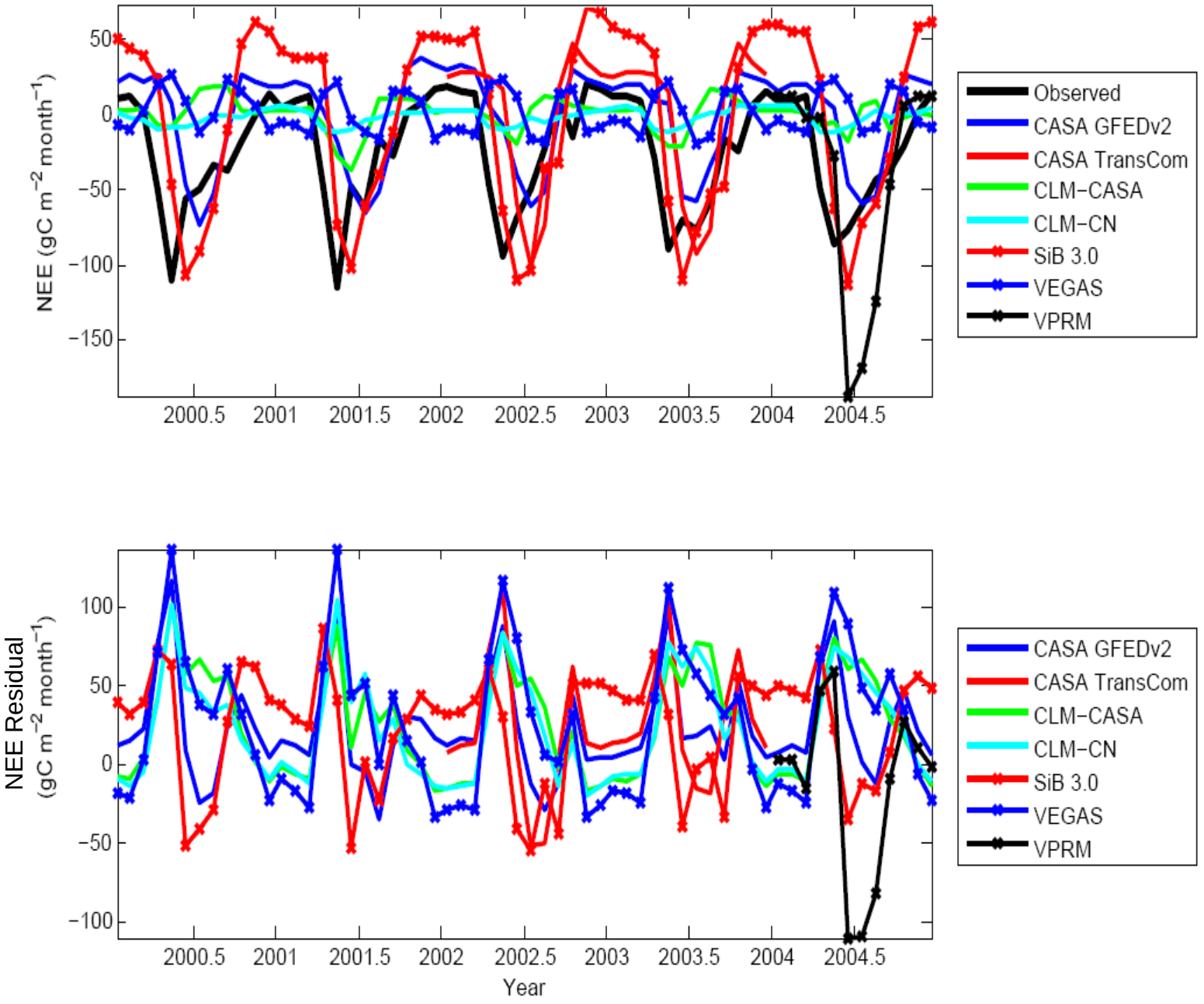

Howland Annual Carbon Flux
1:1
DLEM
EROS
LOTEC
ORCHIDEE
SiBCasa
MODIS
GPP modeled (gC m-2 year-1)
GPP observed (gC m-2 year-1)
1100
1200
1300
1400
1500
1600
1700
1800

Howland: NEE comparison




Howland Annual Carbon Flux
NEE modeled (gC m-2 year-1)
NEE observed (gC m-2 year-1)
500
400
300
200
100
0
-100
-200
-300
-400
-400
-350
-300
-250
-200
-150
-100
1:1
DLEM
EROS
LOTEC
ORCHIDEE
SiBCasa

Howland: NEE comparison – site extracted from regional modeling results



Next steps

- Finalize site selection, modeling participants, and timeline (August)
- Simulations for all sites (September)
- Preliminary analysis of model and observation uncertainty (October)
- Workshop: detailed analysis of results (November)
- Additional analysis (December-January)
- Results ready for Feb 2009 NACP Investigators' meeting