

Regional Model-Data Comparison

An NACP Interim Synthesis
Project

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Coordinators

Synthesis of Interim NACP Results

Ecosystem Models

- Contribute in hand regional, continental results (including ones cut from global analyses)
- A range of temporal and spatial resolutions

There will be no standardization of model runs!

Inversion Models

- Contribute North America results in hand from TRANSCOM or from other relevant activities
- Spatial scales
 - TRANSCOM regions, and
 - 1° grids centered on half-degrees
- Temporal scale - monthly

Regional MDC Objectives

- Development of benchmark data sets and approaches for model-data evaluation.
- Evaluation of strengths and weaknesses of various model formulations, both inverse models and ecosystem models resulting from the comparison to data.
- Formal comparison of inverse and forward ecosystem model results for enhancing identification and diagnosis of temporal and spatial patterns of carbon fluxes.

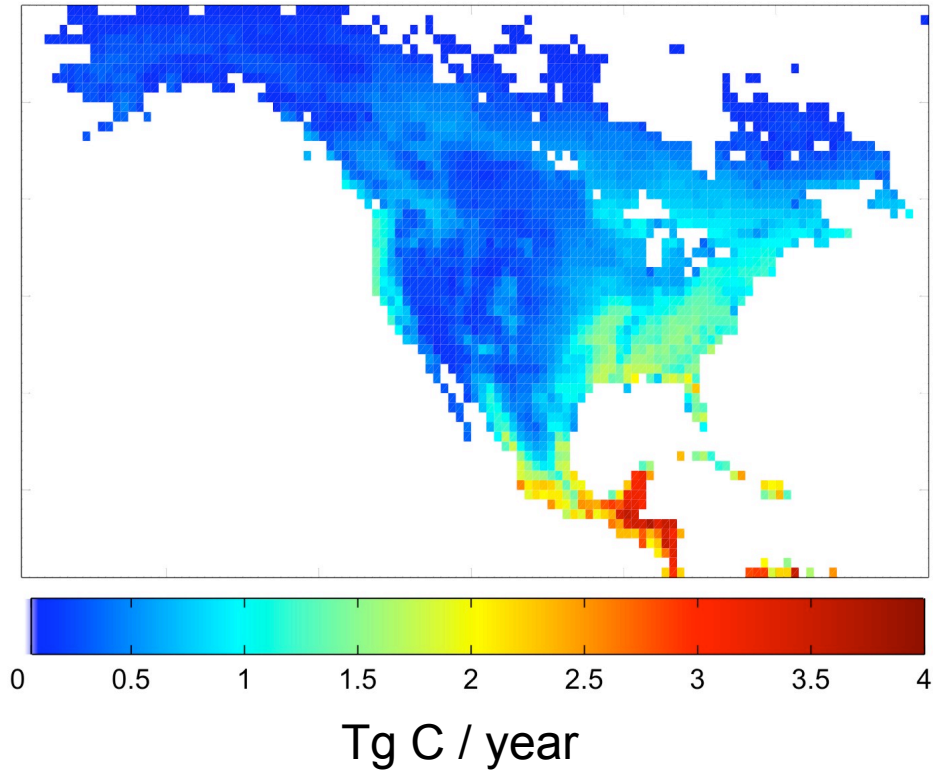
Regional MDC Questions

- Interannual Variation
 - What is the spatial pattern and magnitude of interannual variation in carbon fluxes during 2000-2005?
 - What are the components of carbon fluxes and pools that contribute to this variation?
- 2002 Drought
 - Do model results and observations show consistent spatial patterns in response to the 2002 drought?
 - From measurements and ecosystem models, can we infer what processes were affected by the 2002 drought?
- Identification of Sources/Sinks
 - What are the magnitudes and spatial distribution of carbon sources and sinks, and their uncertainties during 2000-2005?

Observations and Measurements

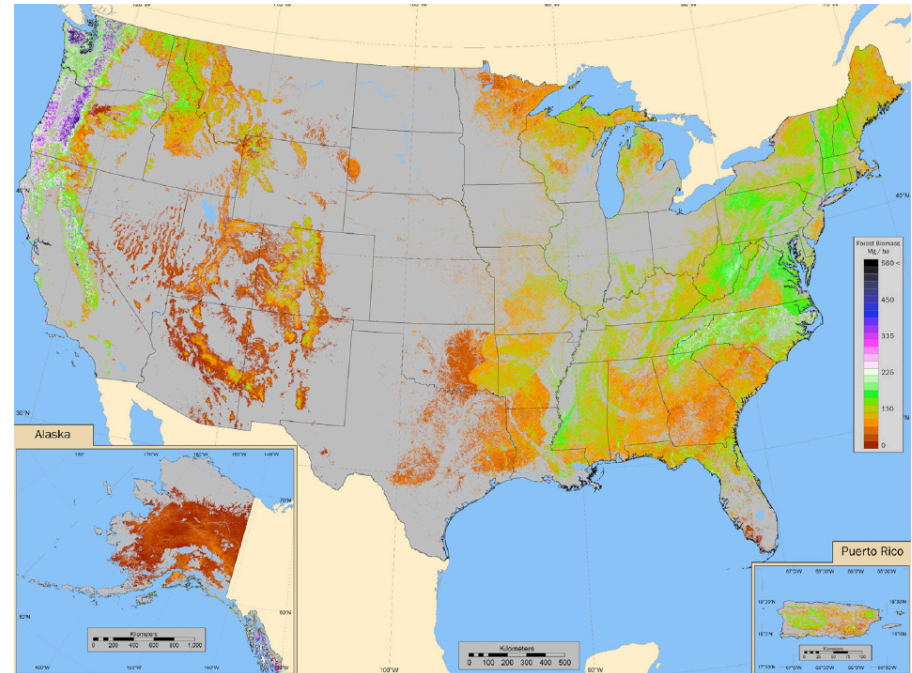
- Satellite based
 - MODIS GPP, NPP, LAI, FPAR
 - NDVI
- Survey
 - NASS crop yield based annual NPP
 - FIA based biomass, wood volume increment
 - Soil C (CONUS-SOIL, <http://www.soilinfo.psu.edu/>)
- Site based
 - CO₂ mole fractions from NOAA ESRL observatories, tall towers, light aircraft, and cooperative air sampling network
 - Eddy flux NEE, estimated GPP, NPP
 - Soil respiration (automatic chambers)
 - Litter decomposition (LIDET)

Cumulative MODIS Derived GPP for 2002



From Deborah N. Huntzinger
(University of Michigan)

FIA Based Forest Biomass



From Blackard et al. (2008), G. Moisen, contact
(Rocky Mt. Res. Sta., USFS)

Example Regional Data Sets for Model Data Comparison

Developed Model Metadata Tool

Metadata for Forward (Ecosystem) Model Intercomparison: Site Model Data Comparison and Regional Model Data Comparison

Note: Please navigate from one question to the next using mouse and left click.

Please enter your E-mail address:

This is your survey ID. It allows you to save your incomplete survey for later access. It will NOT be used for any contact purposes.

Please specify the activity in which you are involved:

- Site Model Data Comparison (MDC).
- Regional Model Data Comparison.
- Both Site and Regional MDC.

1. General Information:

- a. Model Name (acronym):
- b. Model Name (full):
- c. Home Institution Name:
- d. Home Institution Website:
- e. Project Manager/Primary Contact Name:
- f. Project Manager/Primary Contact E-mail:
- g. Give reference(s) for how you want your model to be cited:

h. Spatial Resolution/Extent.

i. Projection (select)

- Lat Lon Sinusoidal UTM
- Other (please specify)

ii. Finest Spatial Resolution of Output:

Resolution of output (e.g. 0.5, 1, 2.5, 10, etc):

Units (select):

- Meters Kilometers Degrees
- Other (please specify)

iii. Number of grid cells (please specify):

iv. Spatial Extent (in decimal degrees):

UL lat (-90.0,90.0): UL lon (-180.0,180.0):

LR lat (-90.0,90.0): LR lon (-180.0,180.0):

i. Temporal Resolution:

i. Finest Temporal Resolution:

- Half-hourly Hourly 3-hourly Daily Weekly Monthly Yearly
- Other (please specify)

ii. Temporal Coverage:

Begin Date (yyyymmdd): End Date (yyyymmdd):

j. Model Information:

[Restart](#) this survey or
[Save](#) entries to finish later or
[Print](#) prior to submitting or
[Submit](#) this survey or
[Clear](#) and start over.

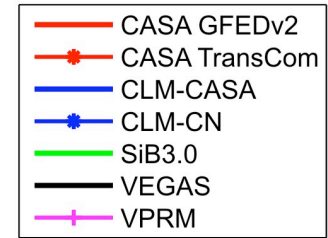
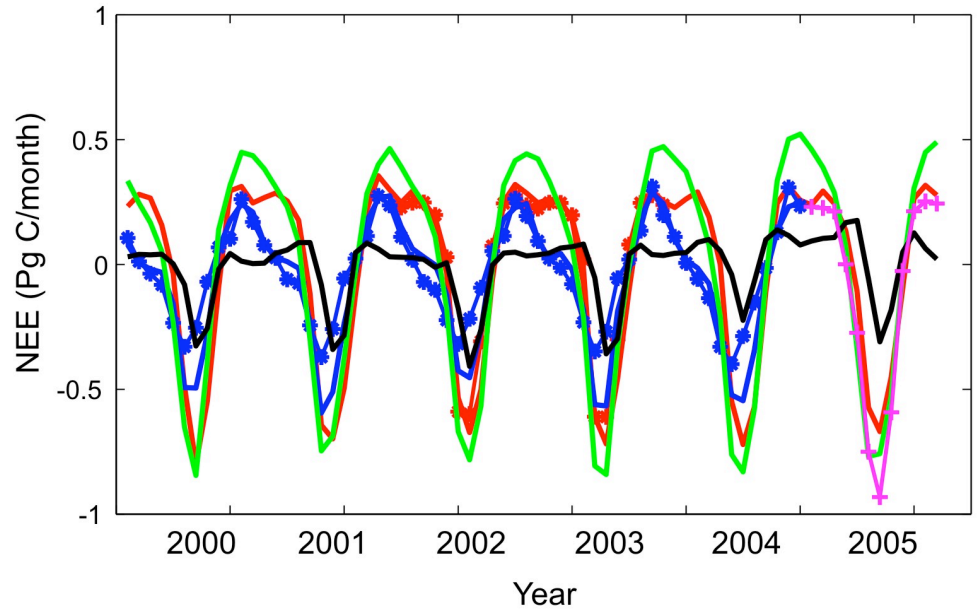
Current Status of Model Submission

| Model | Contact | Metadata | Results |
|---------------|------------------|----------|---------|
| MC1 | Ron Nielson | Yes | Yes |
| LPJml | Ben Poulter | Yes | |
| ORCHIDEE | Hans VerBeeck | Yes | |
| MOD17 | Bruce Cook | Yes | |
| ecosys | Robert Grant | Yes | |
| SiB3 | Ian Baker | Yes | Yes |
| TEM | Dave McGuire | Yes | Yes |
| DLEM | Hanqin Tian | Yes | |
| EPIC | Cesar Izaurralde | Yes | |
| VEGAS | Ning Zeng | Yes | Yes |
| BiomeBGC | Dave Turner | Yes | |
| ED | Mike Dietze | Yes | |
| GTEC | Mac Post | Yes | |
| CLM-CN | Peter Thornton | | Yes |
| CLM-CASA' | Forrest Hoffman | | Yes |
| CASA-NASA | Chris Potter | | Yes |
| CASA GFEDv2 | Jim Randerson | | Yes |
| CASA Transcom | Jim Randerson | | Yes |
| VPRM | Steve Wofsy | | Yes |

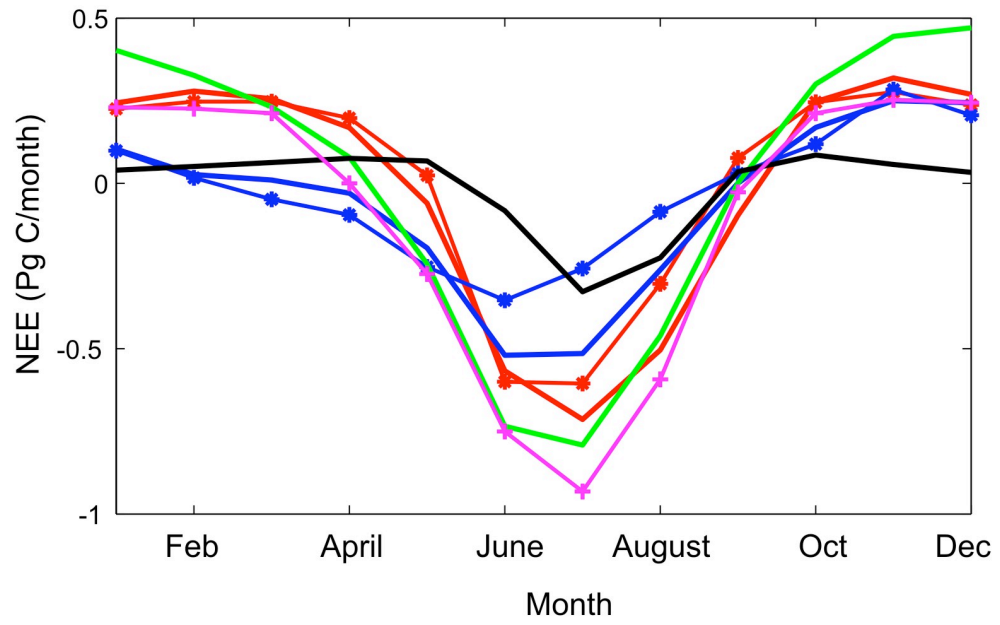
Potential Additional Ecosystem Model Participants

| Model | Contact | Region |
|---------------|------------------|---------------------|
| SiBCASA | Denning/Shaeffer | NA, MCI |
| TECOR | Luo/Zhou | NA |
| ISAM | Jain | NA |
| EPIC | Izaurrealde | MCI |
| CN-CLASS | Altaf Arain | NA |
| CENTURY+MODIS | Ogle | MCI |
| EDCM | Liu/Bliss | NA, MCI |
| CBM-CFS3 | Kurz | Canada |
| ISOLSM | Riley | ARM-CART/MCI |
| CLASS-CTEM | Peng | NA |
| DAYCENT | Parton | MCI, Continental US |
| SSiB2 | Sahoo | NA |

Net NEE North America

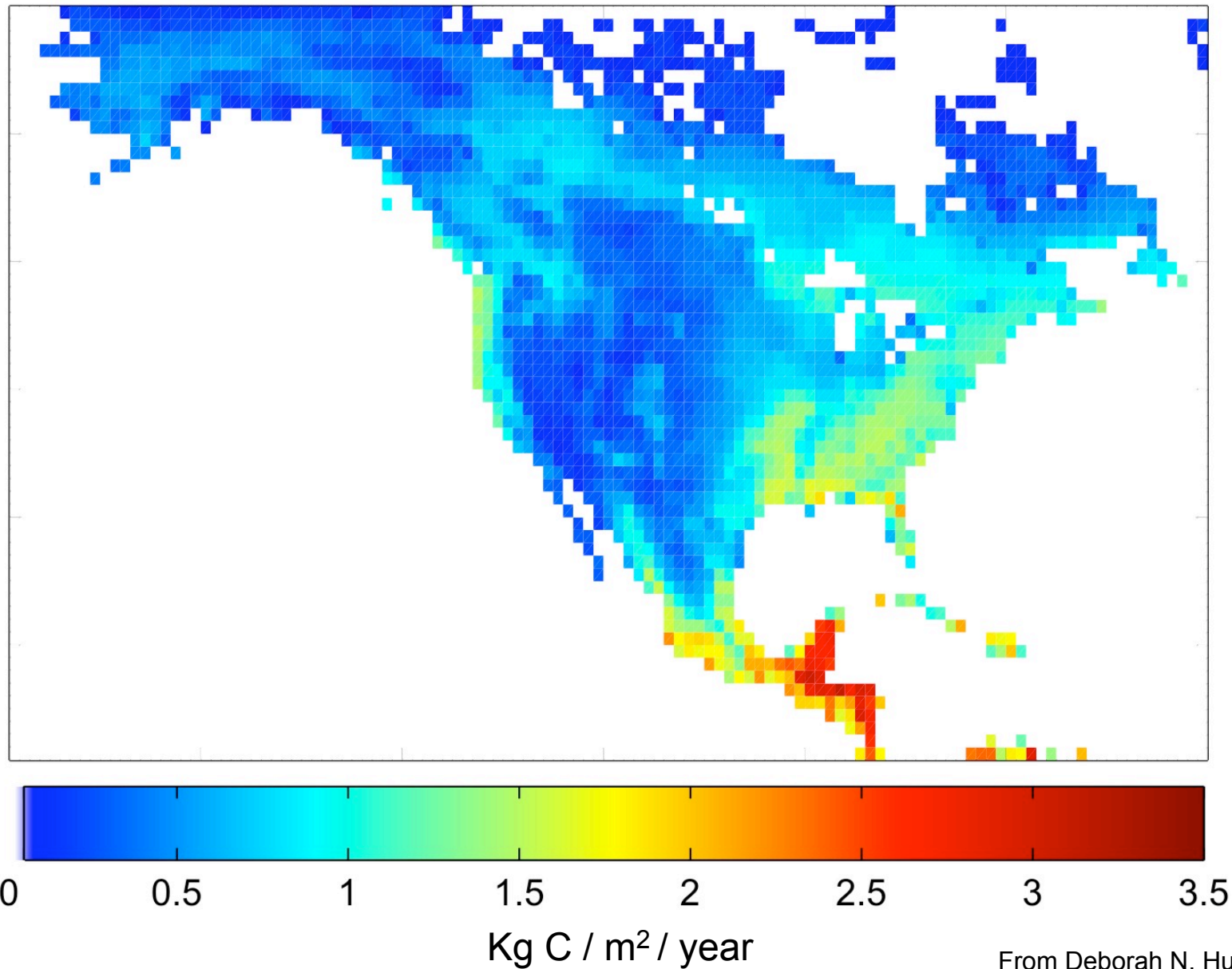


Long-term monthly mean NEE, North America (2000 - 2005)



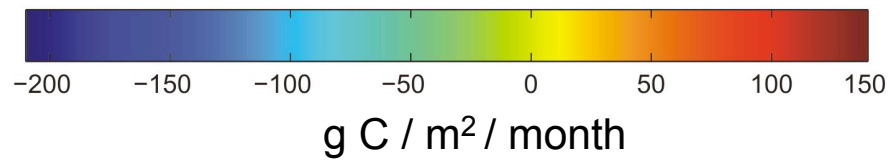
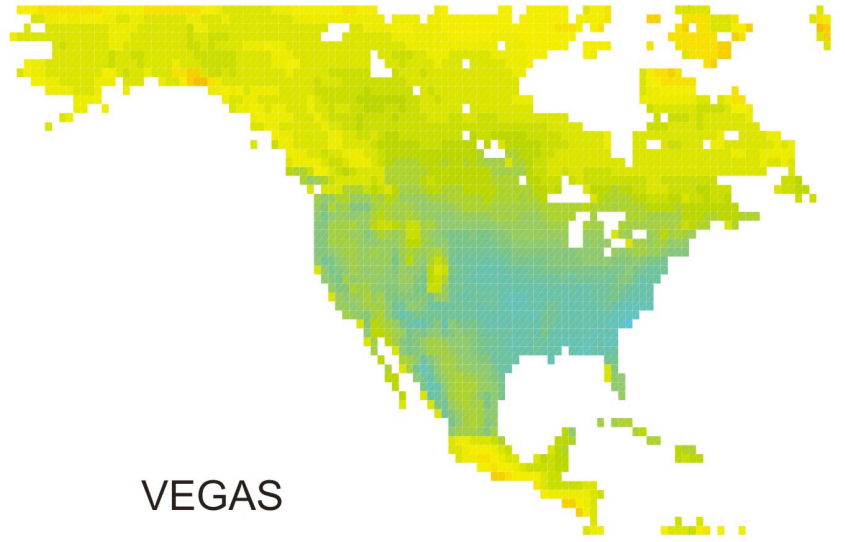
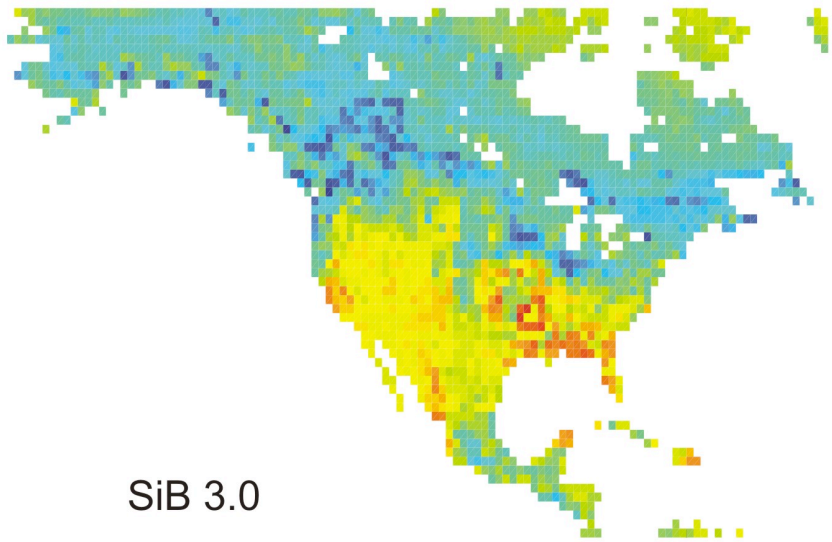
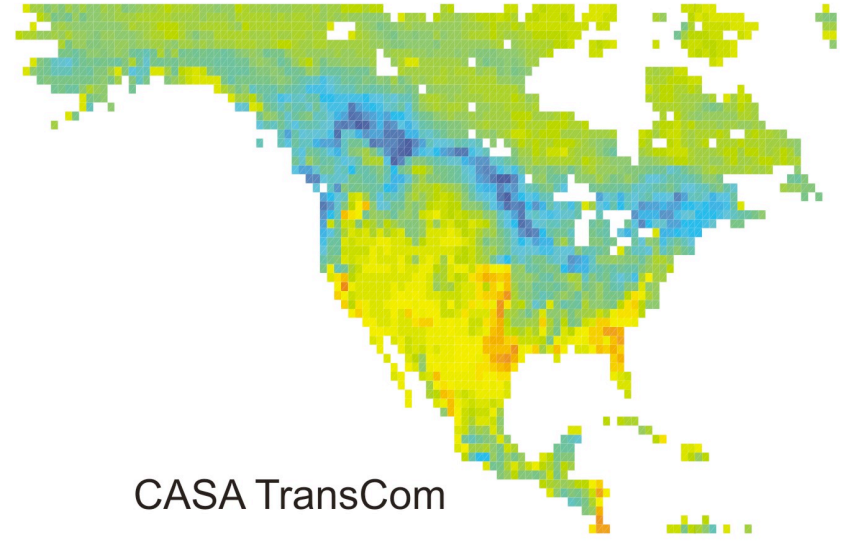
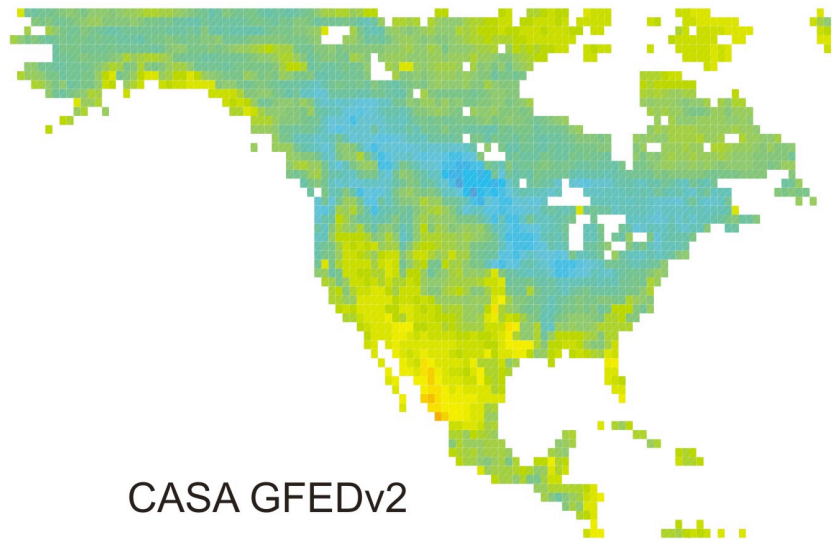
From Deborah N. Huntzinger
(University of Michigan)

Cumulative MODIS Derived GPP for 2002



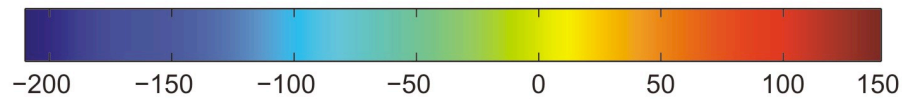
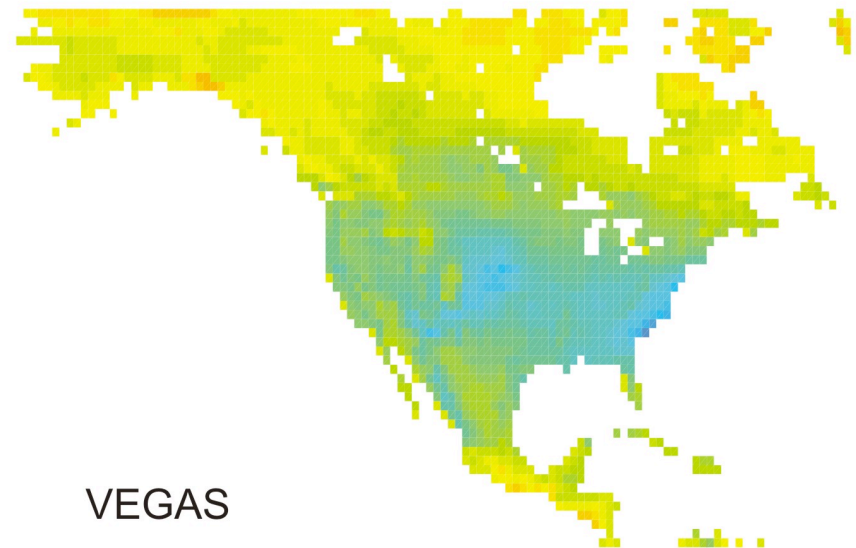
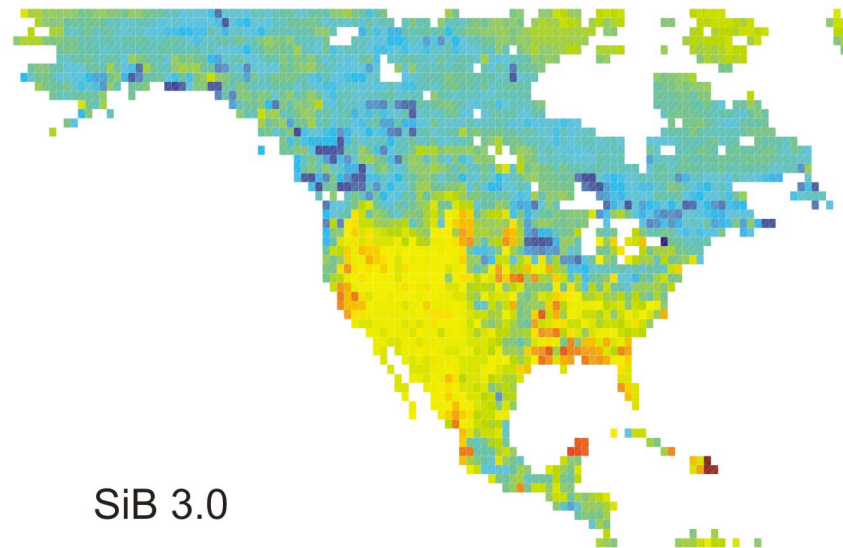
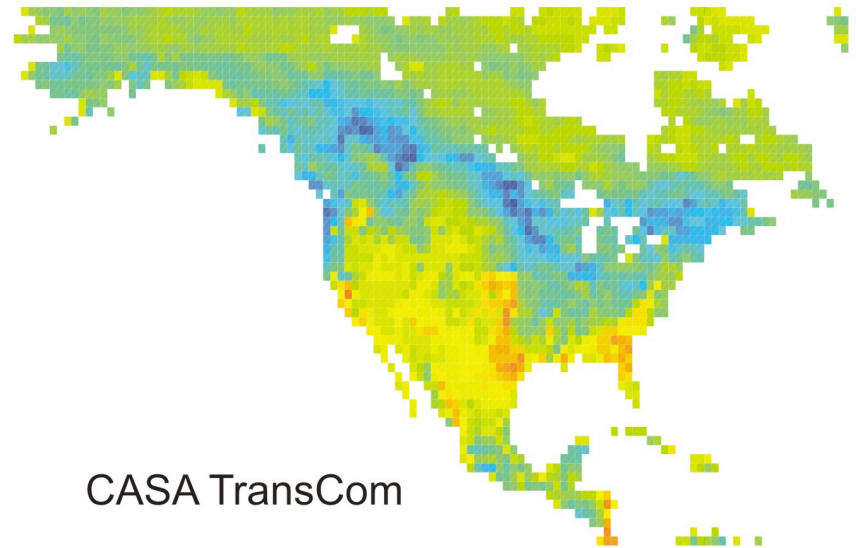
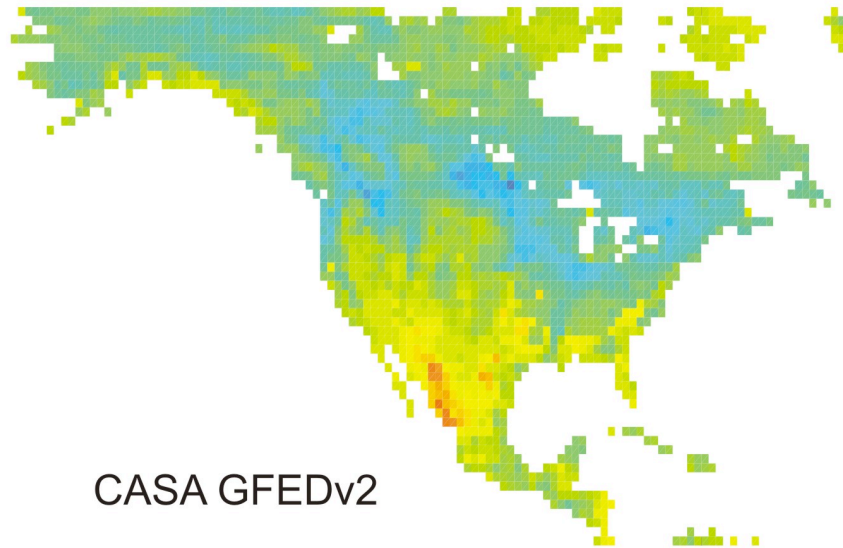
From Deborah N. Huntzinger
(University of Michigan)

Long-term Mean NEE (2000-2005) for July



From Deborah N. Huntzinger
(University of Michigan)

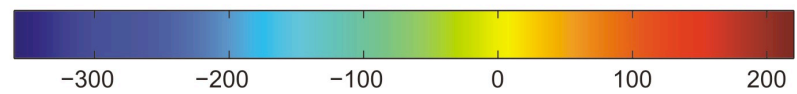
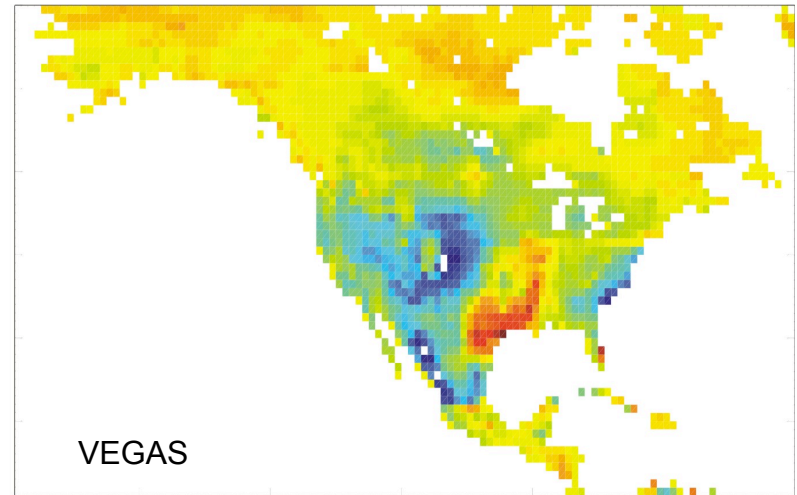
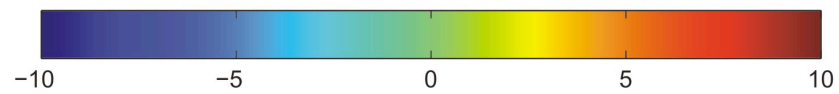
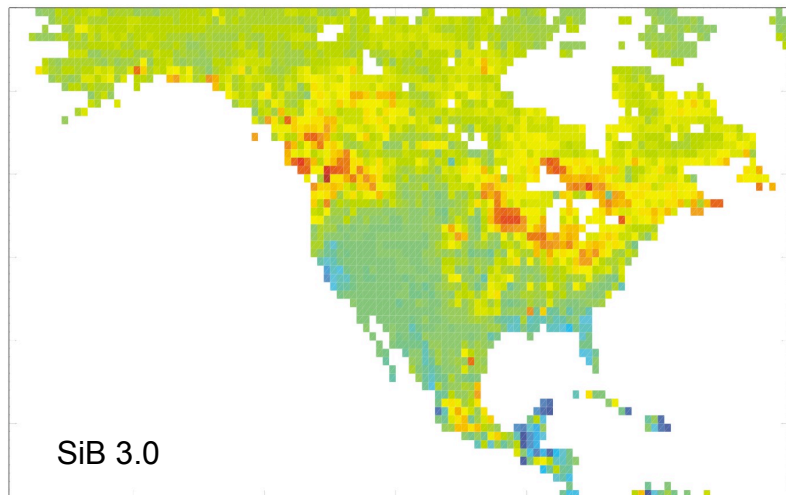
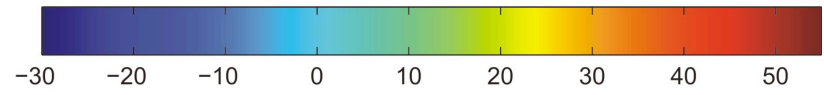
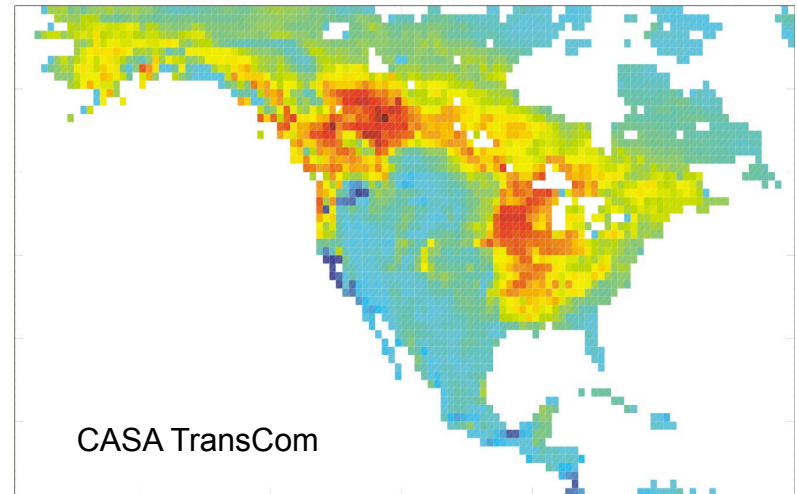
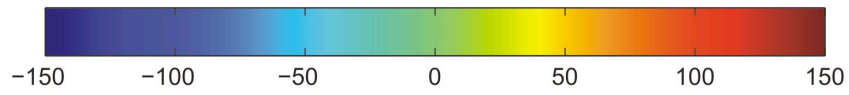
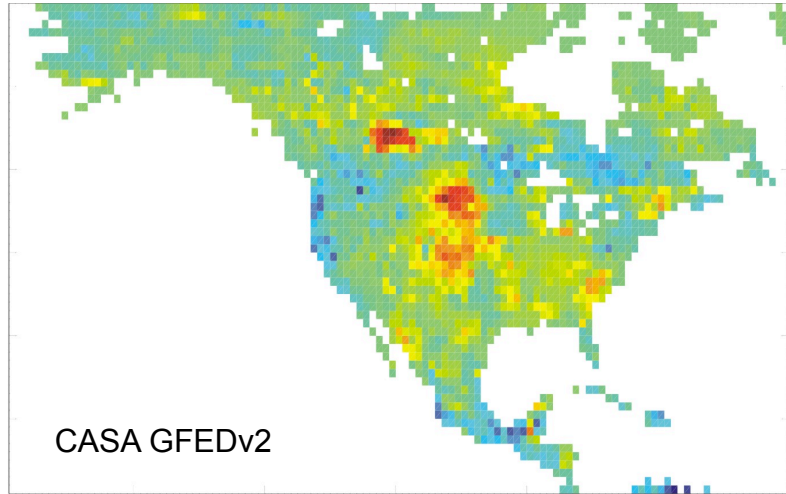
2002 July NEE

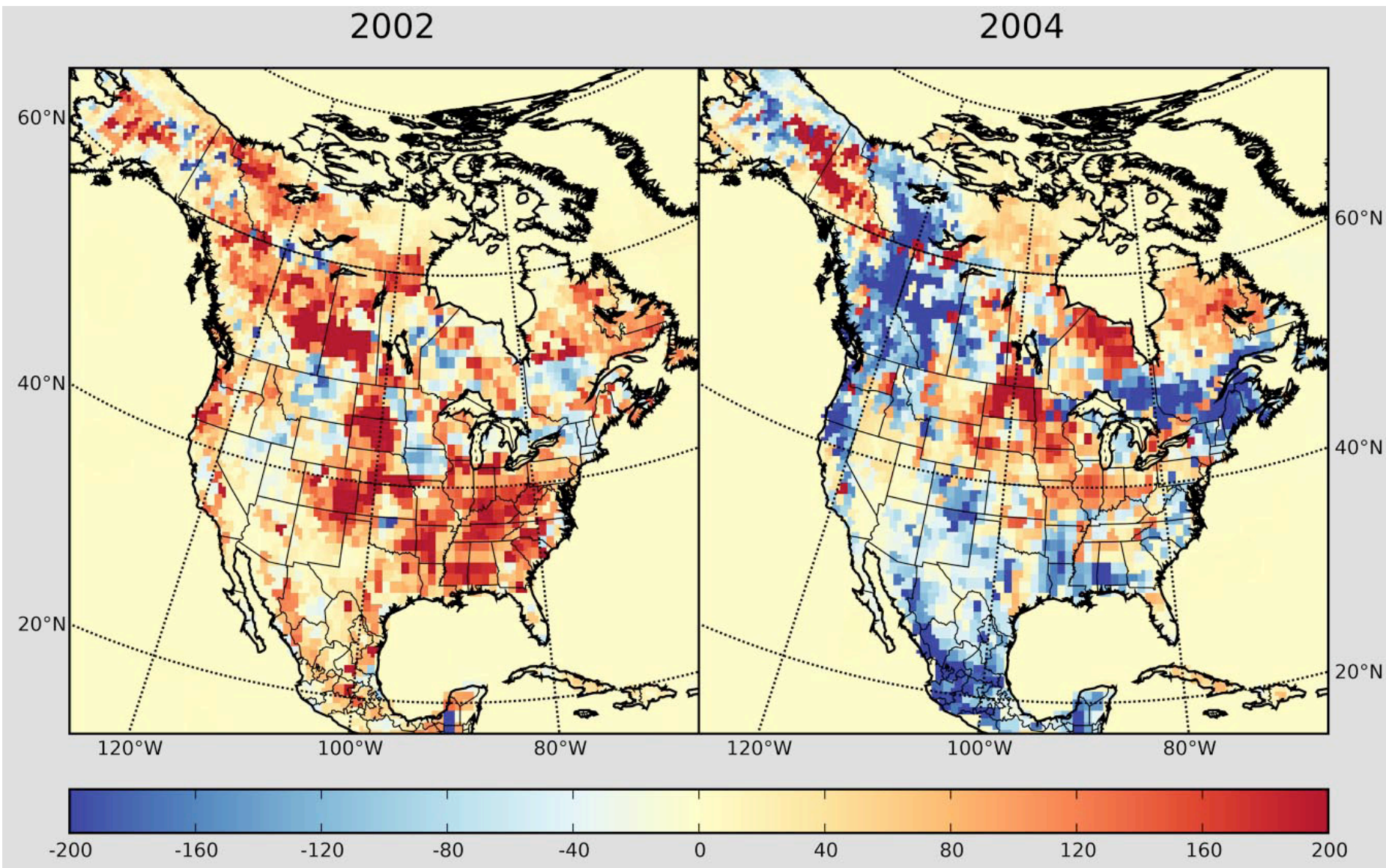


g C / m² / month

From Deborah N. Huntzinger
(University of Michigan)

Cumulative NEE 2002 (g C / m² / year)



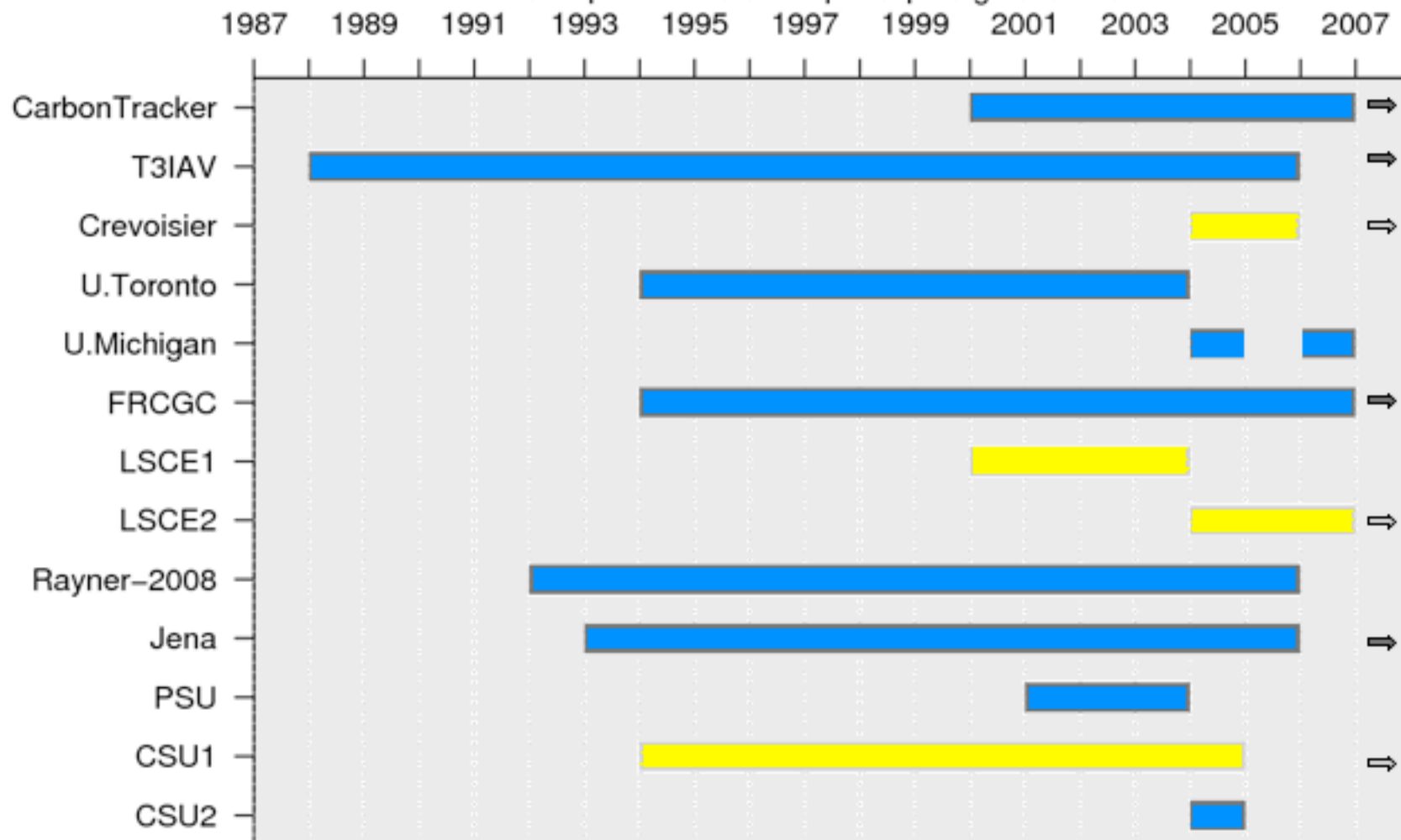



CarbonTracker Inversion Model, Net Terrestrial Summer Flux (gC/m²/yr)
www.esrl.noaa.gov/gmd/ccgg/carbontracker/


Inversions Inventory


- 13 different inversion models have agreed to participate
- 6 are North American projects
CarbonTracker, U. Toronto, PSU, CSU 1 & 2, U. Michigan
- 2 are French, 1 is German, 1 is Japanese, 1 is Franco-American, and 1 is Franco-Australian
LSCE 1 & 2, Jena, FRCGC, Crevoisier, Rayner
- One is the Transcom IAV (Baker *et al.*, 2006) comprising 13 different transport models
- 10 can provide formal results for the 22 global Transcom regions
- 12 can provide 1x1 fluxes (caveat: many assumptions apply)
- Not as much temporal overlap as one would hope (see next slide)

Temporal domains of participating inversions



 provisional information

 details verified

 product being actively updated

Analysis Approaches

Comparison Techniques:

- Statistical point by point comparisons (Taylor plots, cumulative frequency distributions, Index-of-agreement, etc.)
- Spatial pattern comparisons (difference plots, variograms, etc.)

Combinations of Comparisons:

- Inversion model - Data inter-comparison
- Forward/Ecosystem model - Data inter-comparison
- Inverse and Forward model inter-comparison

Resources Required

- Standards for data/model output established in protocol:
 - Use netCDF, CF convention
 - Spatial and temporal scale specifications
 - Tools to aid providers to prepare data, error estimates
- Data repository provided by MAST-DC
- Personnel for collation and initial analysis including regridding, applying statistical analyses – Debbie Huntziger, U. Michigan; MAST-DC; ORNL
- Workshop to review results and develop final analyses, assign team leaders for analyses – Funding is in hand, selection of date and venue to occur by early September, workshop in Oct-Nov.

Schedule

- Synthesis Protocol sent to participants - Feb 2008
- Prospectus to NACP for Workshop Funding - Feb 2008
- Observation data to MAST-DC - ~~May-June~~ July-Sep 2008
- Model results to MAST-DC - ~~May-June~~ July-Sep 2008
- Initial analyses - ~~June to Sept~~ Sept-Oct 2008
- Regional MDC Workshop - Oct 2008
- Write papers - Oct 2008 to Jan 2009
- Present results NACP All-Scientist meeting - ~~Jan~~ Feb 2009
- Submit papers for publication - ~~Feb~~ Winter 2009