Topic 7: Flux and remote sensing, merging data products, future directions

1. Databases (new-generation flux maps)

(1) Make them available (online or offline)

(2) Self-explanatory file format (e.g., NetCDF)

(3) Gridded Flux Subsets? (similar to MODIS Subsets)

- Something to give to flux tower PIs

- Feedbacks from tower PIs

- A standard or multiple data products?

2. Future directions

(1) Start to account for disturbance effects

(2) Uncertainty assessment (input data, scaling, parameters, model structure) -> "true" uncertainty bounds

(3) Evaluate ecosystem services (e.g., carbon sequestration, food and wood production, water yield)

(4) Evaluate and improve Earth System Models (ESMs)

(5) Merging data products and intercomparison

- Juxtaposition of upscaling methods and gridded flux fields

- RCN II?

- Resources to facilitate this exercise

Data Management/User Support

Deb Agarwal – Berkeley Lab

Gilberto Pastorello – Univ. of Alberta

What does data synthesis support infrastructure look like?

- Evolves
  - Archive(s) of raw data
  - Federated catalog of data locations/inventories
  - Development of data products
  - Integrated database
  - Data analysis tools and support
  - Rama's knowledge center

Developing the Knowledge-base

- Publications – linked to data/methodology
- Documentation of collection and processing methods
  - Publication of methodology
  - Visual flow description/assumptions detail
  - Enabling an external user to understand and repeat
- Metadata collection and maintenance
  - Calibration
  - Disturbances
  - Biological information
  - Descriptions
- Development of a living data management system/ecosystem
- Ability to drill down from end product all the way to original raw data

Standards

- Equipment
- Metadata
- Data formats
  - Raw
  - Processed
- Data products
- Data sharing formats/methods
- Data access rules

Constraints

- Science objectives
  - Budgets
  - Products
- Man power (passionate people)
- Level of maturity of the technology/processing/standardization

Where do we go from here?

- Footprints?

- Synthesis efforts?

- Data products?

- Development of a data management plan to support?

- Fluxdata.org blog available as a discussion portal

FLUXCOM(P) – Intro for discussion

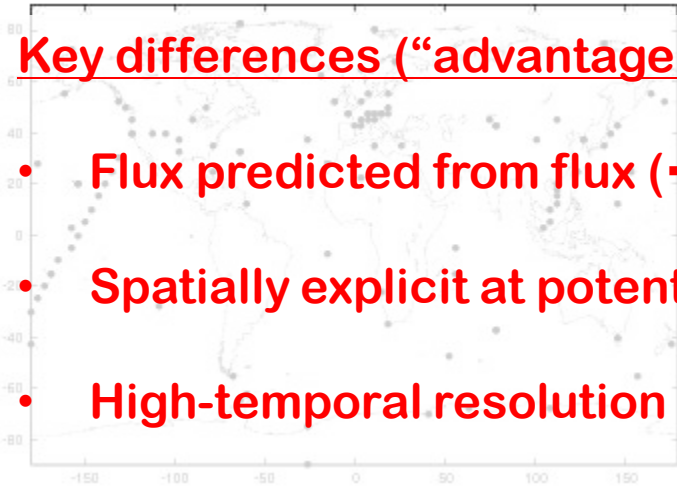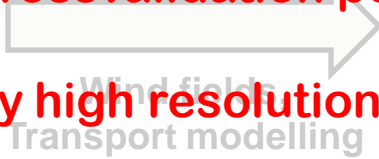# FLUXCOM – motivation and goals

- Structurally different approaches to up-scaling from flux-towers to continent and globe (Xiao et al, Ichii et al, Jung et al., Beer et al., Fisher et al, Papale et al.,….)

  Common question: *How do we make use of the information from FLUXNET at site level and integrate with "global data" (remote sensing, reanalysis)?*
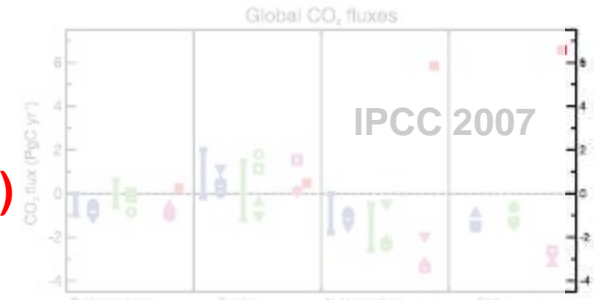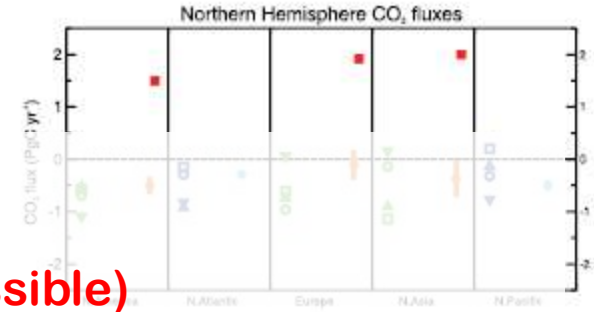
Similar situation as atm C-science years ago

Northern Hemisphere CO₂ fluxes
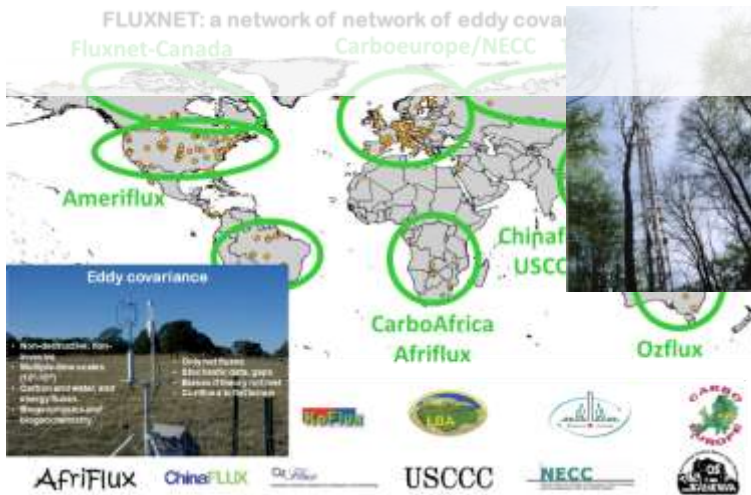
Key differences ("advantage FLUXNET"):

- **Flux predicted from flux (→ crossvalidation possible)**

- **Spatially explicit at potentially high resolution**

- **High-temporal resolution possible (incl. diurnal)**

Wind fields

Transport modelling

Global CO₂ fluxes

IPCC 2007

Atmospheric CO₂ concentration network

Large-scale biosphere-atmosphere flux estimates

FLUXNET: a network of network of eddy cova...
Fluxnet-Canada   Carboeurope/NECC

Ameriflux   Chinaf
USCC

CarboAfrica   Ozflux
Afriflux

Eddy covariance

AfriFlux   ChinaFLUX   ...   USCCC   NECC

Bio-Atm flux network

Remote sensing and meteo fields, „Biosphere" modelling
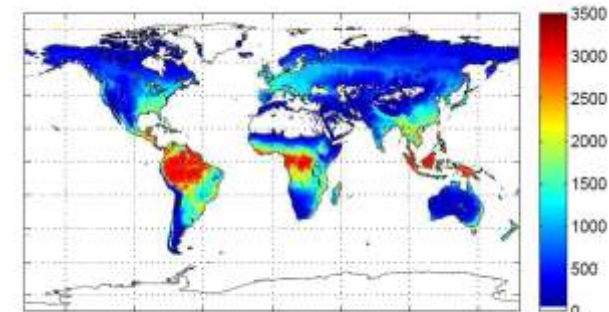
Spatially explicit flux estimates

➡ Proposal to use LaThuille synthesis data

PROPOSAL·FOR·FLUXNET·SYNTHESIS·PUBLICATION¶

Proposers:¤	Markus·Reichstein,·Dario·Papale,·Martin·Jung¤
Collaborators·needing·access:¤	Participants·who·need·to·train·their·method·with·the·dataset:·e.g.·Jingfeng·Xiao,·Josh·Fisher.....·¤
Remarks¤	A·call·for·participation·will·result·in·the·final·list.·A·workshop·with·participants·is·foreseen·in·late·2011¤

TITLE·OF·PAPER·AND·OUTLINE¶

FLUXCOM·–·an·intercomparison·study·on·the·estimation·of·global·flux·fields·from·eddy·covariance·data·using·empirical·up-scaling·techniques¶

Questions to be discussed

- **Who** wants to participate to this community effort?
  - Create predictor variables (locally, globally)
  - Apply up-scaling algorithm (core of intercomp)
  - Analysis of intercomparison
  - ➜ come-up with mailing list
- What is an appropriate protocol?
  - Compromise between comparability and "freedom"
  - Compromise between wishes and feasibility
  - Addressing uncertainties (obs data, representation, driving data)

Towards a protocol (suggestions)

- Output target
  - Limited by drivers and comp efficiency
  - Monthly/sub-monthly(?) fluxes (carbon, energy)
  - 0.5° latlon tiled by IGBP vegetation type
- Predictors
  - Let's make a list what is already used (must be available globally…)
    - E.g. Short-wave rad, VPD, Tair, Precip, wind speed
    - EVI, NDVI, FAPAR, LSWI, soil moisture…
- Training/Validation/Application approach
  - One standardized approach with minimum data set (same predictors, and grids ➔ only differ on "how" information is extracted (feature selection, machine learning algorithm)
  - Factorial approach wrt drivers (x meteo data sets, y FPAR sets) for some approaches
  - Free approach….

A list…

Approach / PI / email	Predictors	Target variables