

Bench Marking: CURRENT ACTIVITY, PLANS and ASPIRATIONS

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Bench marking for JULES developments
Bench marking to constrain global model predictions

Overview

1. Impose seasonal leaf area and soil carbon. (No DGVM or phenology prediction)

Check fluxes of carbon, fluxes and stores of water and heat over several months (min)

2. Impose vegetation type and soil carbon (No DGVM)

Check fluxes and stores of carbon, stores of water over several years

3. Run free (i.e. use DGVM)!

Check stores of carbon over several decades

3. Stores of carbon (long term)

Question: Can the Land Surface Model (with observed long-term climate) predict the observed vegetation cover and the soil carbon stores?

Data for bench marking:

Land cover maps (easy). CURRENT ACTIVITY

Maps of soil carbon (not easy). ASPIRATION

Use of EO and multiple data streams. CURRENT ACTIVITY: CTC&NCEO

Long term atmospheric CO₂ records (see next slide)

Use of long term atmospheric CO₂ data to bench mark terrestrial carbon stores

- Inverse modelling (can identify where the carbon was absorbed by inverting the whole model). PLAN
- Ensemble modelling (run forwards many times to identify which parameter sets give the observed record). ASPIRATION

2. Fluxes and stores of water and heat (medium term)

Question: Can the Land Surface Model (with observed climate and soil and vegetation type) reproduce the interannual variability of seasonal leaf area index including fire disturbance?

Data for benchmarking:

Use of EO data of LAI is main source of information CURRENT ACTIVITY (CLASSIC, NCEO). Issue – is this a model product?

Fire maps

1. Fluxes and stores of water and heat, fluxes of carbon and trace gases (short term)

Several questions:

A. Water and Heat

B. Carbon

C. Trace Gases.

c. Trace Gases

- ?
- Science Theme leaders to advise

b. Carbon fluxes

Question: Can the land surface model reproduce the right carbon fluxes from photosynthesis, soil respiration and plant respiration?

Data for bench marking

Fluxnet and other sites: CURRENT ACTIVITY

Detailed process information at key sites (e.g. Arctic: ABACUS). See next slide

Regional Bench Mark sites for carbon processes?

- ABACUS could provide a prototype for the kind of detailed bench-mark sites we need to improve the carbon modelling (soils, plants, dates of carbon, fluxes, EO etc)
- If other regions were identified, similar programme of field-campaign could be made.

a. Water and Heat.

Question: can the land surface model reproduce the right water and heat fluxes and stores

- *at the hourly time-scale?*
- *at the daily time scale?*
- *at the seasonal time scale?*

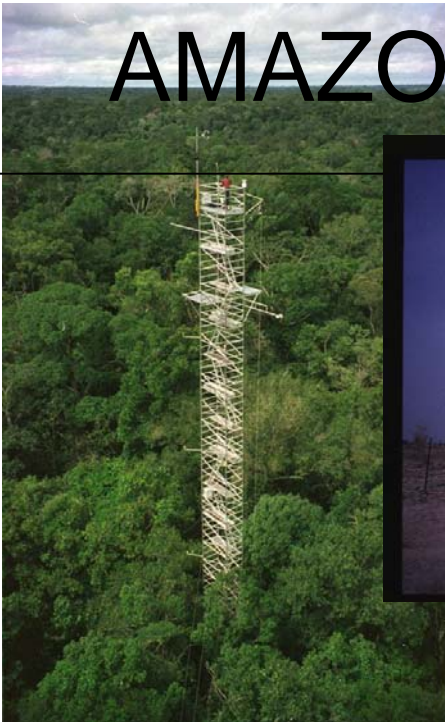
(larger time scales depend on vegetation and climate)

Extra Q: Permafrost and ground water – long term water and heat stores.

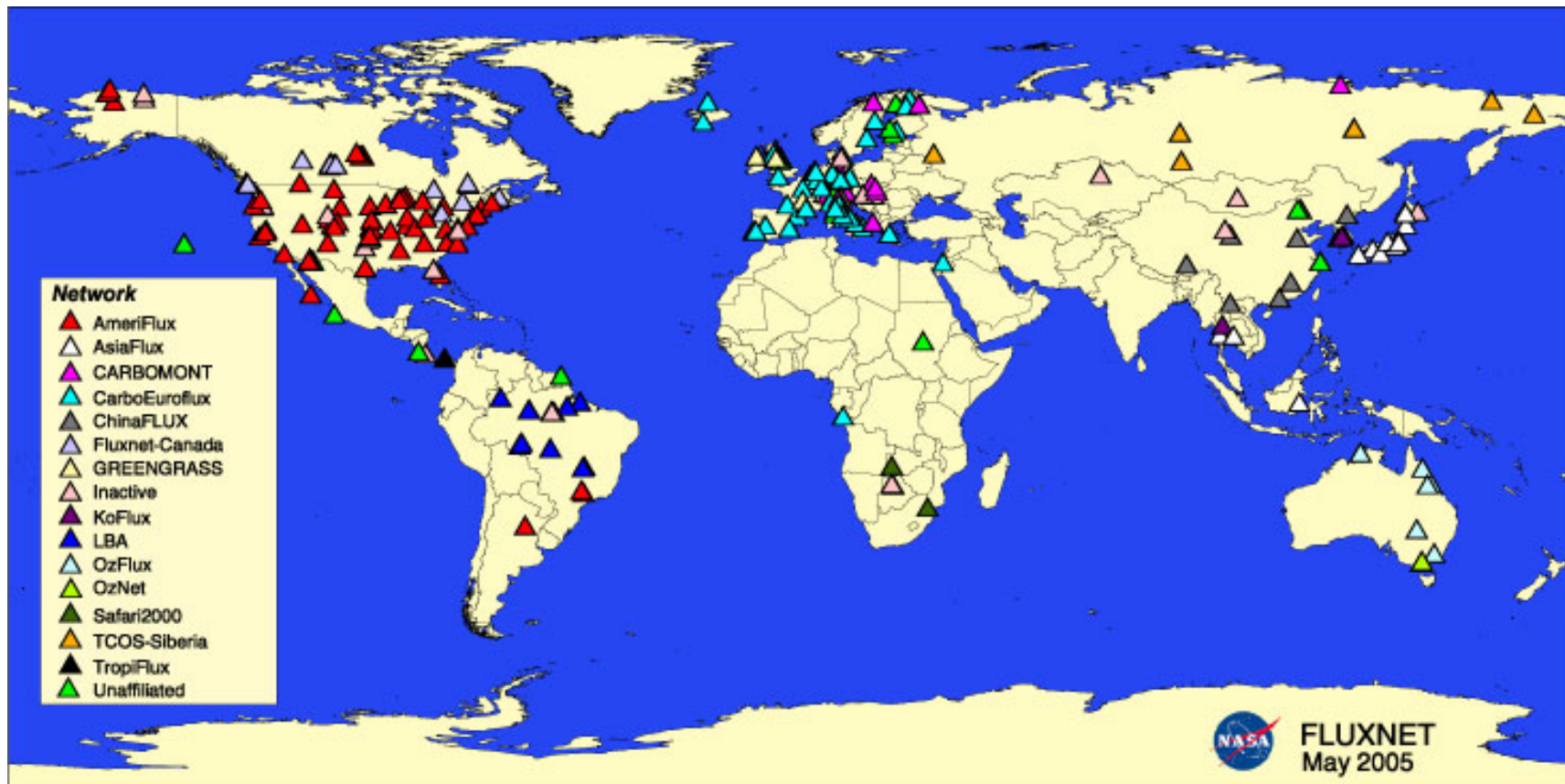
CEH's role in JULES

Past (1980s, 90s): provide evidence for key aspects of the land surface role in climate: EVAPORATION and HEAT fluxes and SOIL physics

AMAZON, SAHEL and the ARCTIC

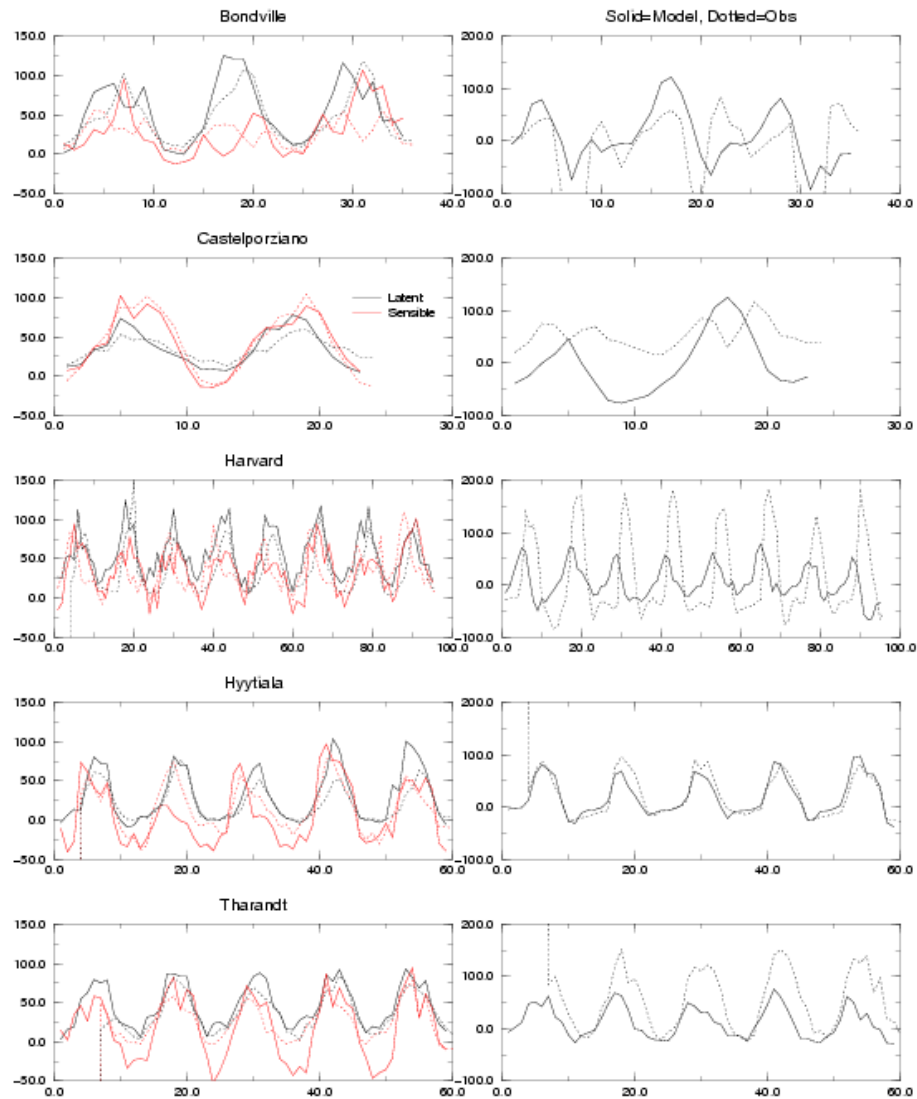


Selection of FLUXNET sites plus others?



Latent and Sensible Heat Fluxes

Carbon Dioxide Flux

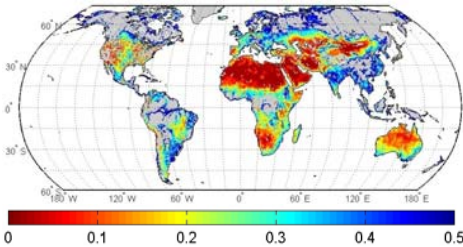


Fluxnet data

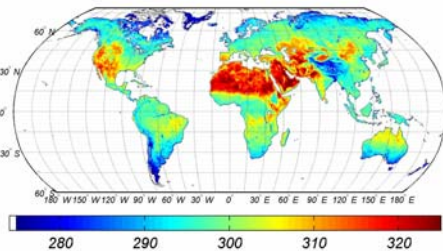
to be expanded....

25 + YEAR OF GLOBAL EVAPORATION (link to Sandy Harrison)

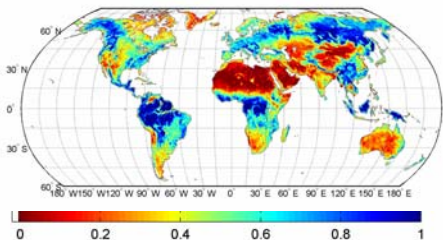
Soil Moisture*



Surface Temperature*



Vegetation Characteristics*

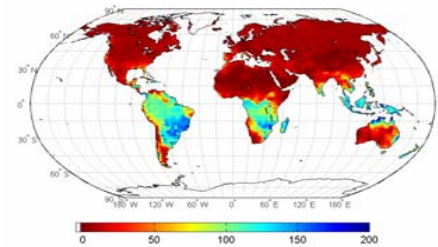


Net Radiation (ISCCP)
Precipitation (GPCP)

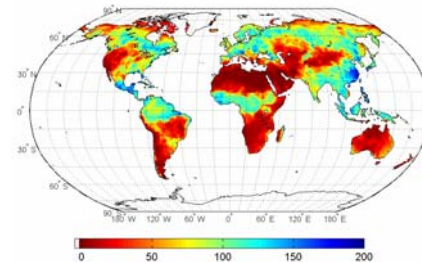


Physically Based
Evaporation Model

Evaporation (Jan)



Evaporation (Jul)



Monthly E maps are based
on Choudhury et al., 1998

* Developed by VUA

Other global data

- River Flows – link with Sandy Harrison.
CURRENT ACTIVITY
- Earth Observation of Snow cover - PLAN
- GRACE – gravity estimates of continental water
ASPIRATION

Regional studies

(like ABACUS but for energy and water)

West Africa: HAPEX-Sahel, AMMA and
WATCH

Arctic: WATCH, new project required

Europe: WATCH and others

India: WATCH

Point process studies

To be decided.....

e.g. Amazon with more information than the
FLUXNET sites

Plans or Aspirations?

- We have a post to co-ordinate the Bench Marking
- Develop strategy with Data Assimilation team
- The strategy will be presented at the IGBP congress in May
- More resources required to do this really well!
- Issues: Quality of data

Bench Marking plan

January 2009: User-friendly Bench Marking tool box available

March 2009: Run workshop for Science Theme Leaders on use of Bench Marking tool box

July 2009: Bench Marking system on the web

January 2010: Report on performance of JULES across Bench Marks