



GIS " Climat-Environnement-Société "
Sur le changement climatique et ses impacts sur la société

Changement climatique, écosystèmes, utilisation des sols et ressources en eau

= Fusion of themes 3 and 4 of RTRA proposal

**Authors: *N. de Noblet (LSCE), A. Ducharne (Sisyphe), B. Sultan (LOCEAN),
C. Ottlé (LSCE), P. Leadley (ESE), N. Viovy (LSCE), L. Abaddie (Bioemco).***

Additional laboratories involved: *CETP, CIRED, IDES, LMD, LISA*

Strong interactions with *INRA Grignon*

Climate & Atmosphere (CO₂, H₂O, N₂O, CH₄, etc)



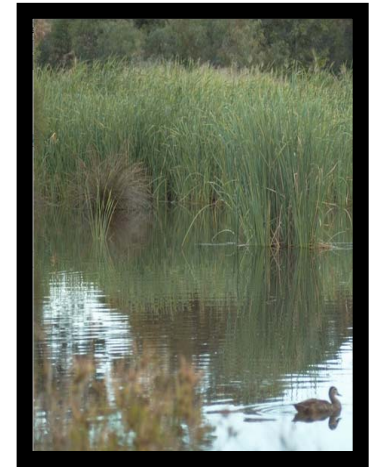
Intensive agriculture



Extensive agriculture



Forests



Wetlands & freshwater systems

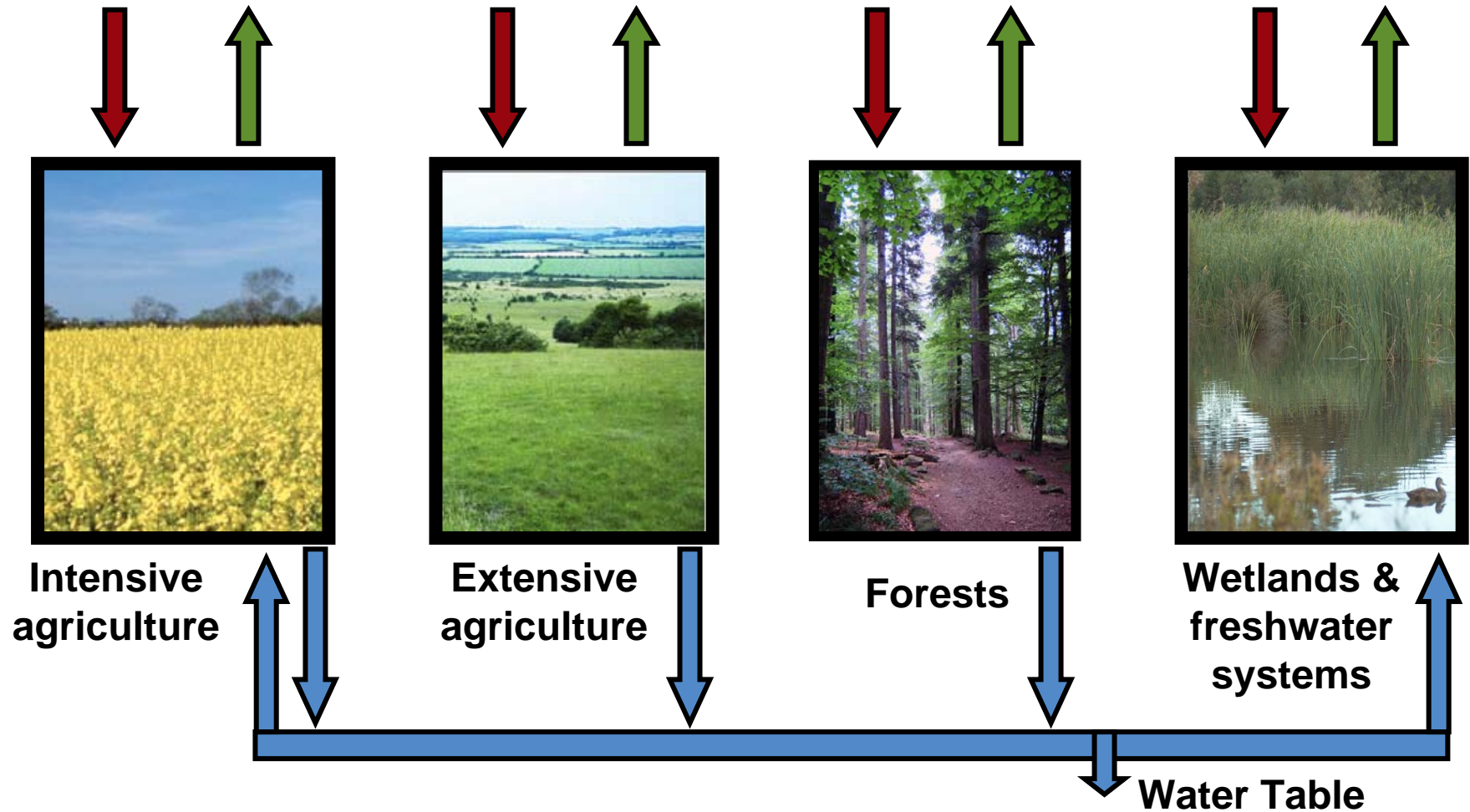



= impact of climate & atmospheric change on ecosystems




= effects of ecosystem function on climate & atmosphere

Climate & Atmosphere (CO₂, H₂O, N₂O, CH₄, etc)

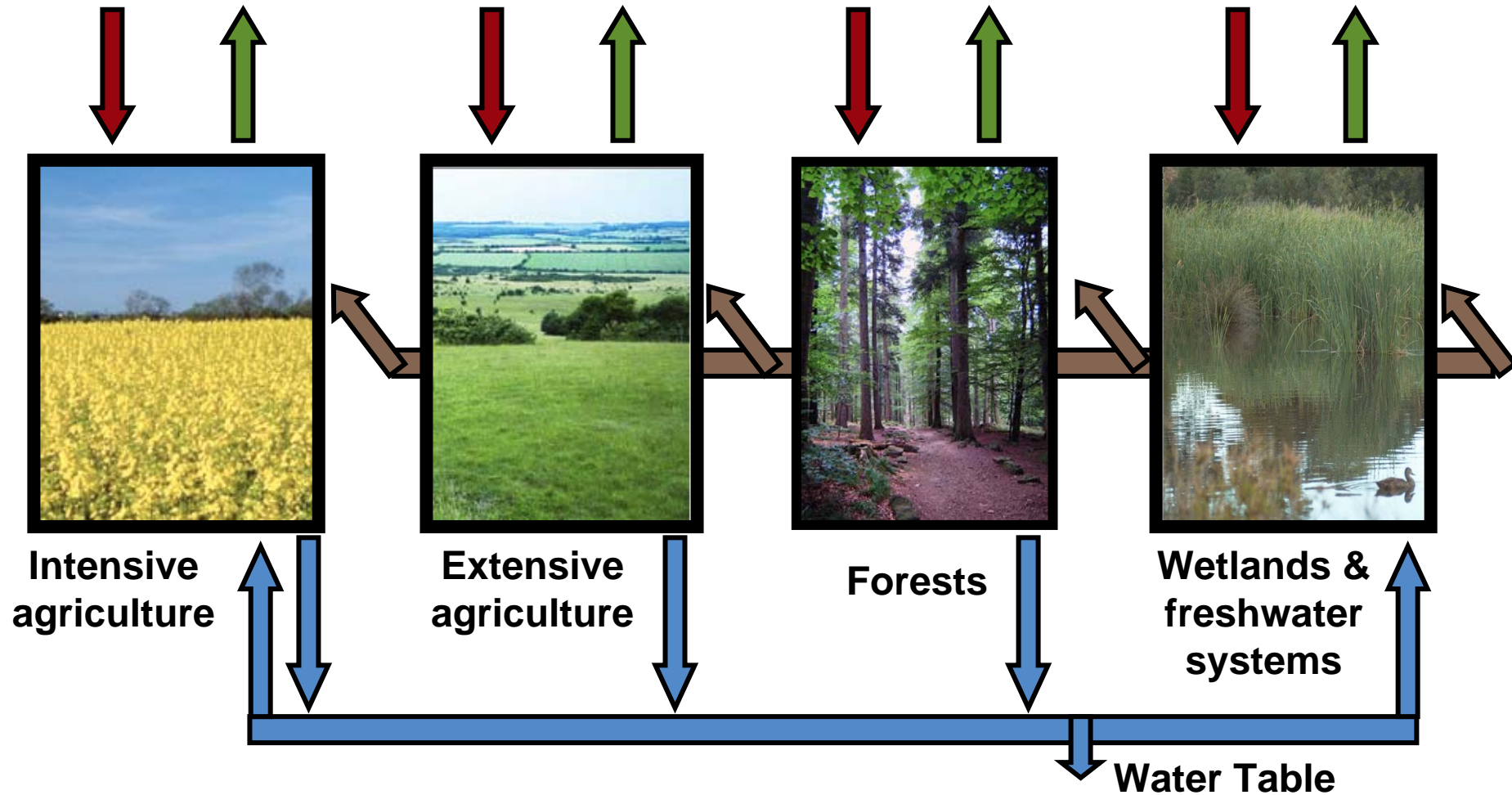



 = impact of climate & atmospheric change on ecosystems

 = effects of ecosystem function on climate & atmosphere


 = effects of ecosystem function on water flow & water quality


Climate & Atmosphere (CO₂, H₂O, N₂O, CH₄, etc)



 = impact of climate & atmospheric change on ecosystems

 = effects of ecosystem function on climate & atmosphere

 = effects of ecosystem function on water flow & water quality

 = land use change

Integrating Activities

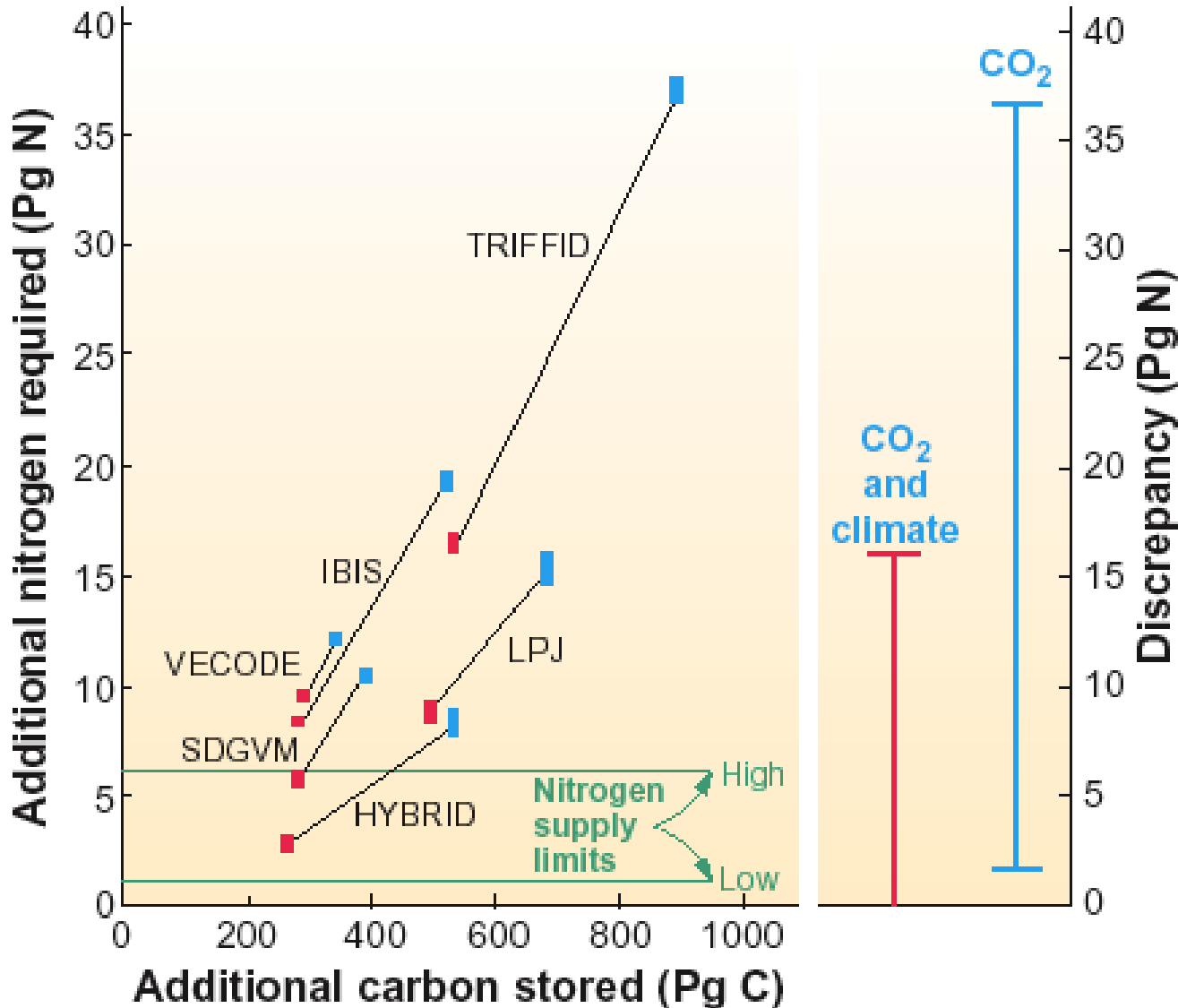
- **Climate interactions with biogeochemical cycles and plant productivity: soils, crops, trees** - *Luc Abaddie (soils)*
- **Climate change and water resources** - *Agnès Ducharne*
- **Land use change: interactions with climate and socio-economic drivers** - *Nathalie de Noblet & Philippe Ciais*
- **Impacts of extreme events on natural and cultivated ecosystems**
- **Global change and biodiversity**
- **etc...**

Goals - enhance collaboration between Paris region laboratories and increase their international visibility by:

- Integrating experiments, observations and models,
- Linking global, regional and local scales = observe and predict global scale patterns and processes based on a sound understanding of underlying mechanisms,
- Crossing disciplinary and laboratory boundaries,
- Providing input to and leadership in international scientific programs; e.g., GCP, iLEAPS, GLP, DIVERSITAS,
- etc...

Nitrogen and Climate Change

Bruce A. Hungate, Jeffrey S. Dukes, M. Rebecca Shaw, Yiqi Luo, Christopher B. Field



Dynamic Global Vegetation Model (DGVM) predictions for 2100

- = CO₂ only
- = CO₂ + climate

Predictions in the IPCC third assessment report

2003 Science
302:1512-1513

EXPERIMENTS

IMAGINE: *Effects of elevated CO₂, temperature and precipitation on grasslands.*



ECOTRON at Foljuif: *a tool for studying biodiversity & ecosystem functioning*



INRA Grignon: *long-term field studies of agroecosystem functioning*

OBSERVATION

Soil gas fluxes

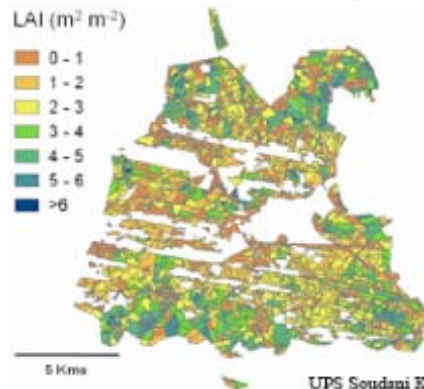
Plant photosynthesis and respiration

Eddy flux towers: esp. CO₂, H₂O, NO_x & N₂O



Isotopic tracers

Remote sensing



MODELS

SOMCO (Bioemco) - Soil C and N dynamics

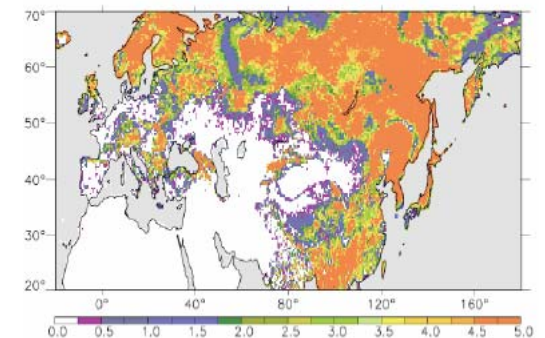
CASTANEA (ESE) - Forest ecosystem model

STICS (INRA Grignon) - Crop ecosystem model

PASIM (LSCE / INRA Clermont) - Pasture model

ORCHIDEE (LSCE) - Dynamic global vegetation model (DGVM)

Productivité Végétale



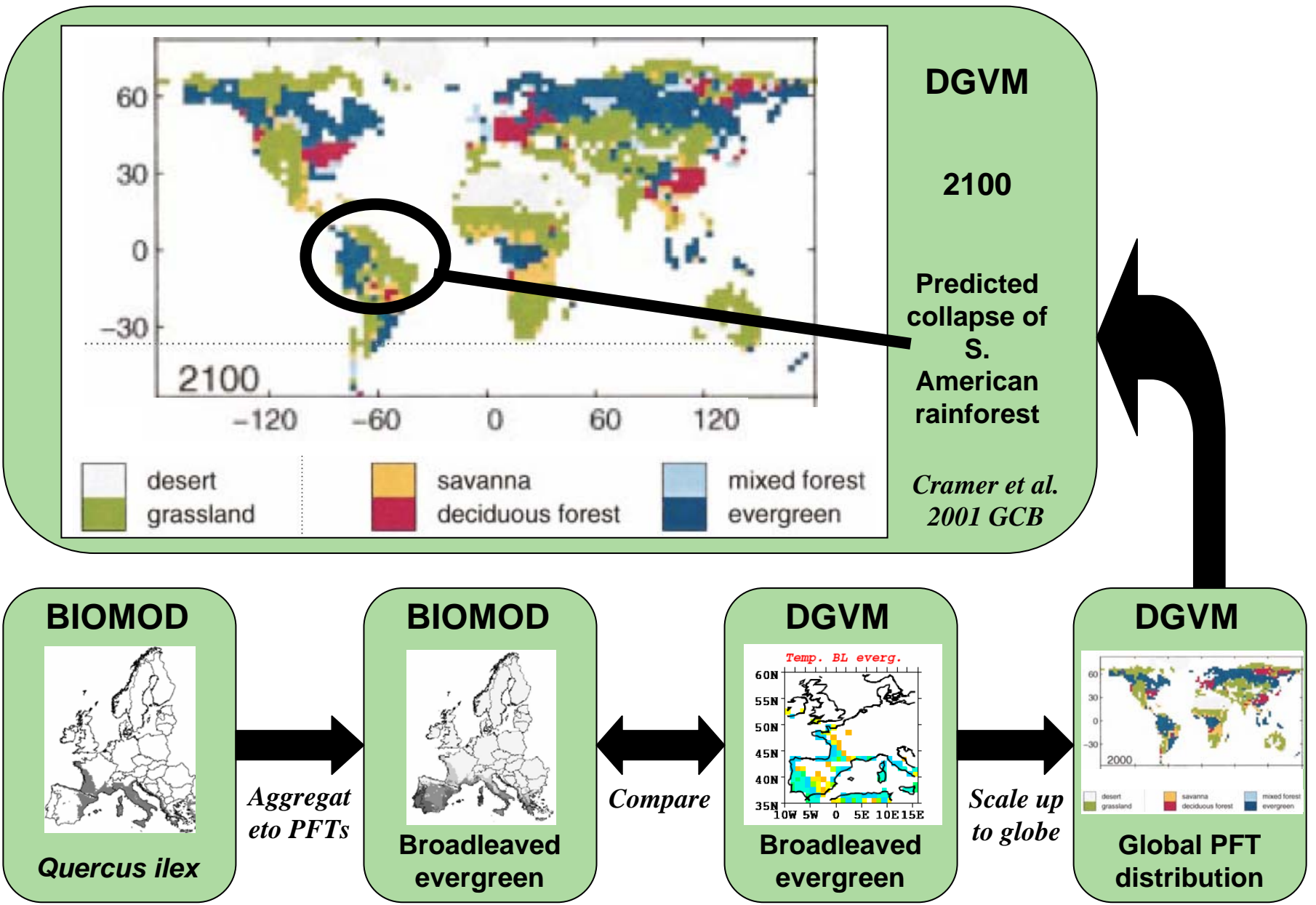
A multi-regional study using bioclimatic models

Thomas et al. 2004. *Nature*

- Used species-based bioclimatic models for several regions plus species area relationships to predict the effects of climate change on biodiversity.
- "We predict, on the basis of mid-range climate-warming scenarios that 15-37% of species... will be 'committed to extinction'" by the year 2050.
- In many regions, climate change was predicted to be a more important threat to species extinction than habitat destruction.



Scaling up to global diversity / Feedback to global C cycle and climate



**Thanks to everyone who contributed to this theme
and my apologies to everyone that I left out by
oversight.**

We will be planning a theme meeting in the near future.
Please let us know if you are interested.