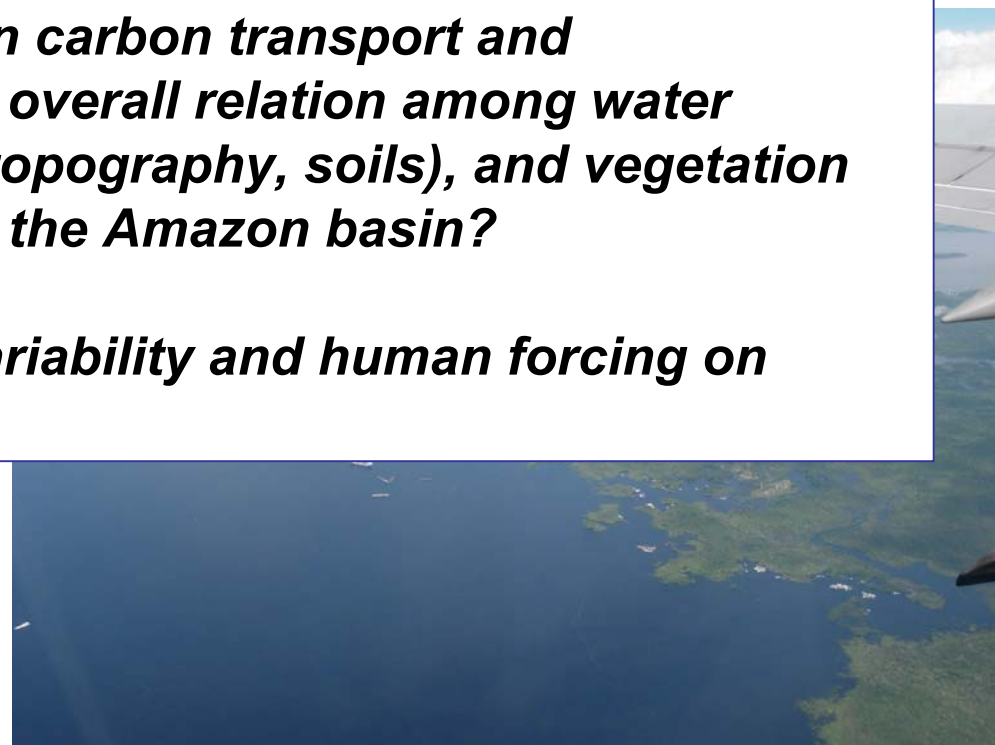
How do composite processes of land-water interactions scale up to generate regional patterns?

What is the size and character of the riverine carbon pool and the timing of its mobilization compared to net atmosphere-land carbon uptake? (and what are the factors controlling the partitioning of carbon between evasion and fluvial export?).

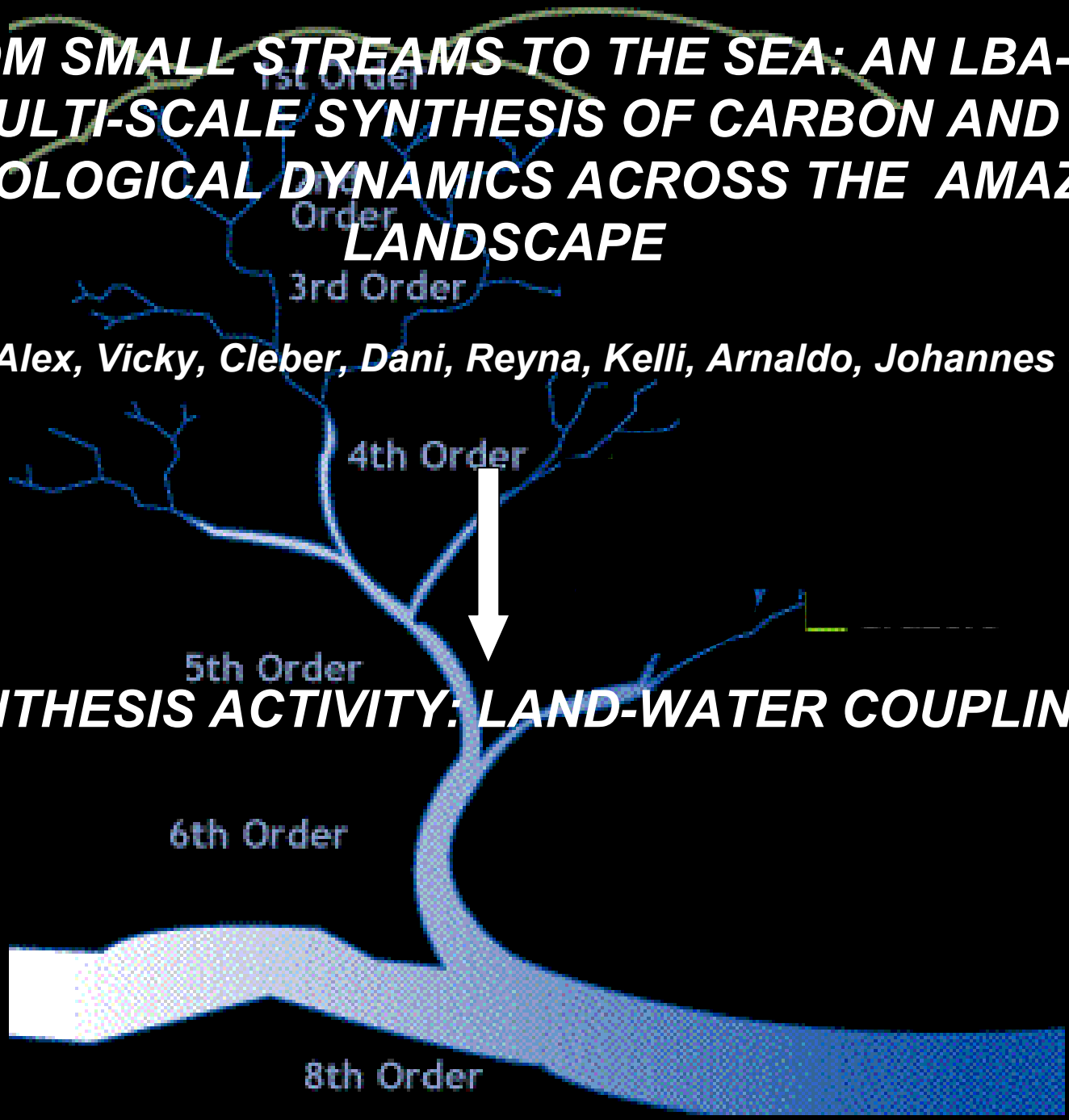
What do these regional patterns in carbon transport and transformation indicate about the overall relation among water movement, landscape structure (topography, soils), and vegetation structure and productivity across the Amazon basin?

What are the effects of climate variability and human forcing on fluvial carbon mobilization?



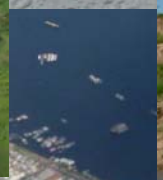
FROM SMALL STREAMS TO THE SEA: AN LBA-III MULTI-SCALE SYNTHESIS OF CARBON AND HYDROLOGICAL DYNAMICS ACROSS THE AMAZON LANDSCAPE

Jeff, Alex, Vicky, Cleber, Dani, Reyna, Kelli, Arnaldo, Johannes …



SYNTHESIS ACTIVITY: LAND-WATER COUPLING

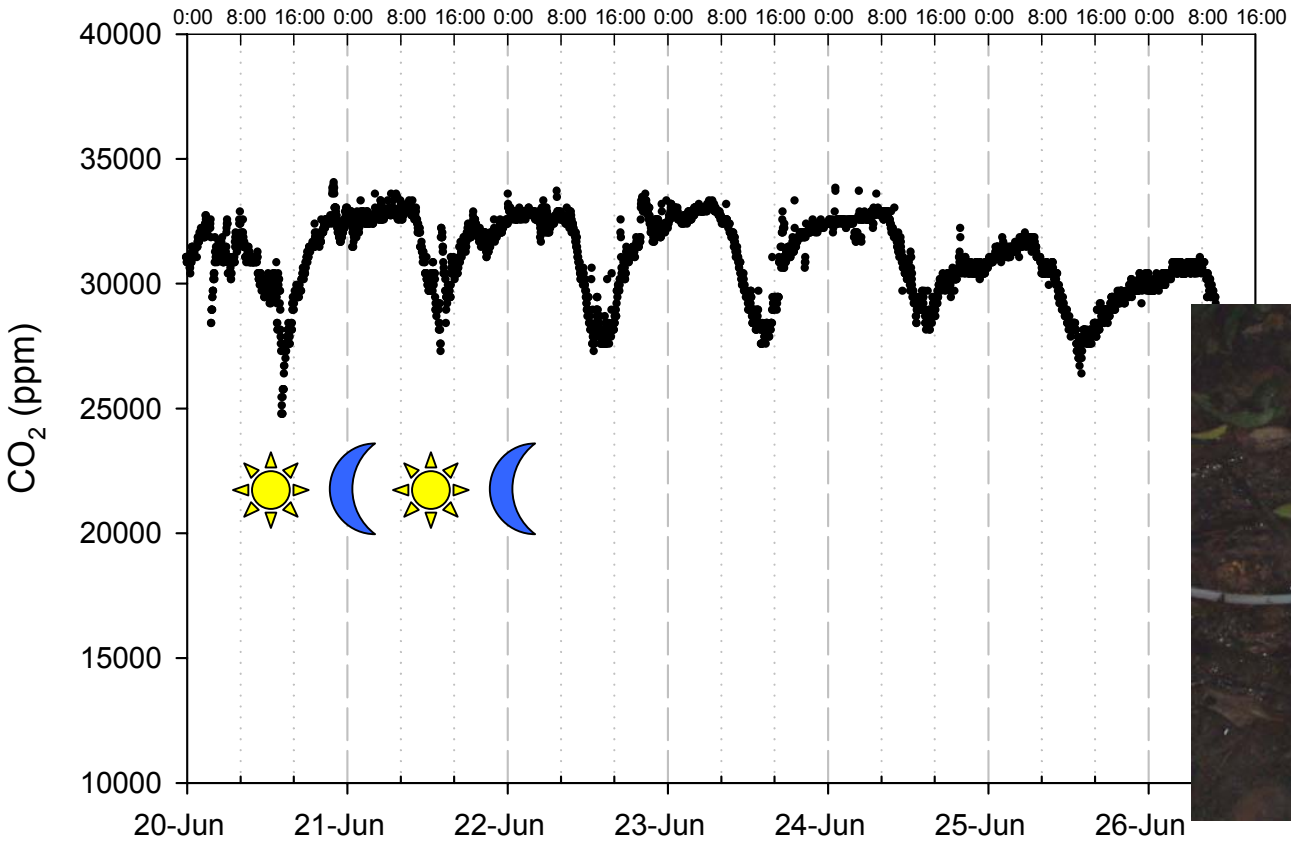
***Assessment of Processes Controlling pCO_2: Regional Scale Patterns of Sources and Processes* – several "update" vignettes……**



Sources of CO_2

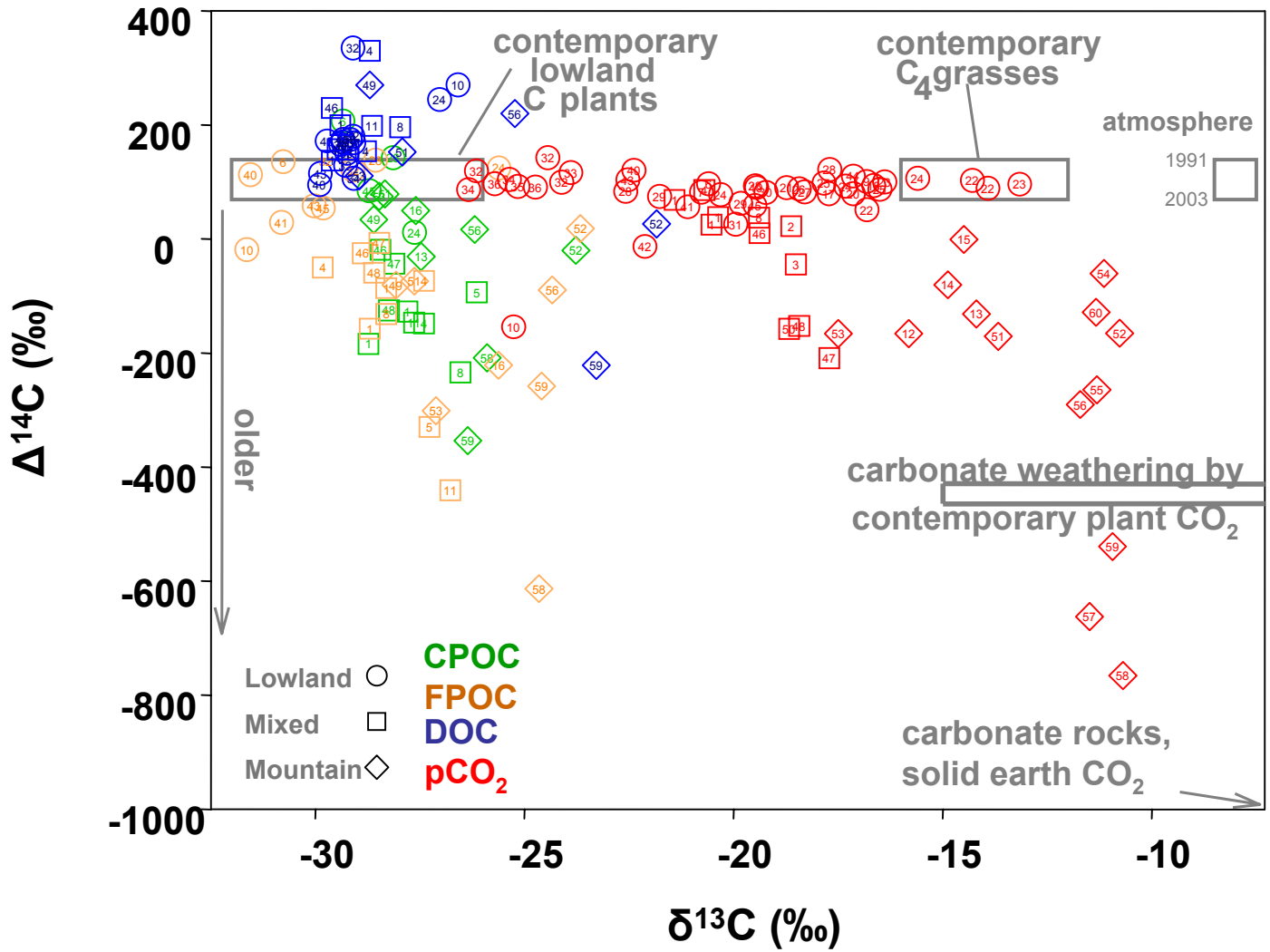
UFMT/Cornell (J. Lehmann, M. Johnson, E. Couto, S. Riha, L. Rodrigues, M. Abdo, E. Selva, and E. Fernandes

Diurnal fluctuation of CO_2 in groundwater seep

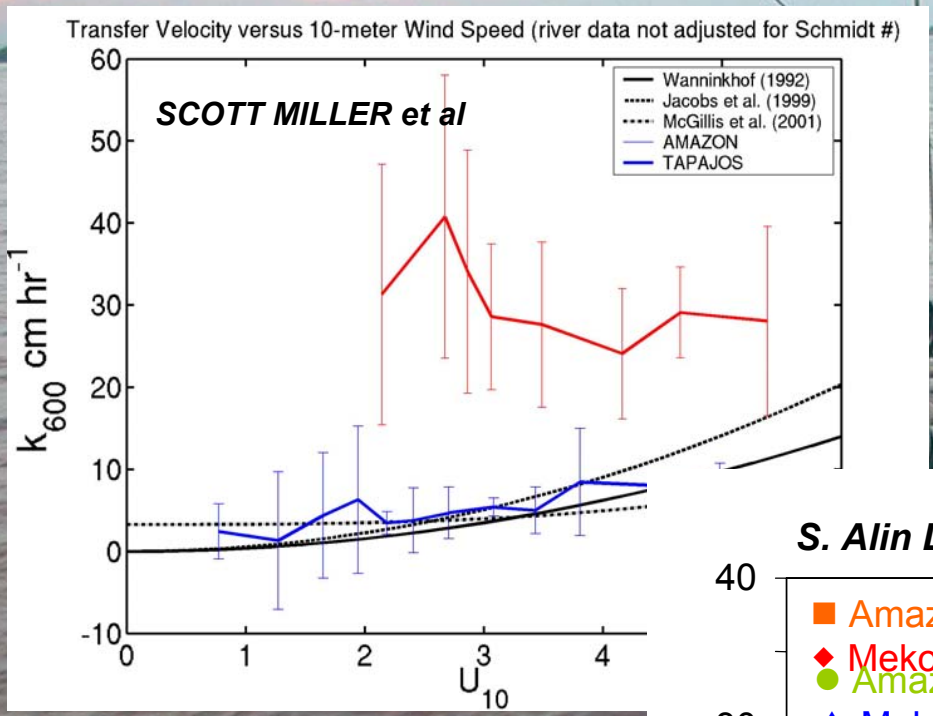


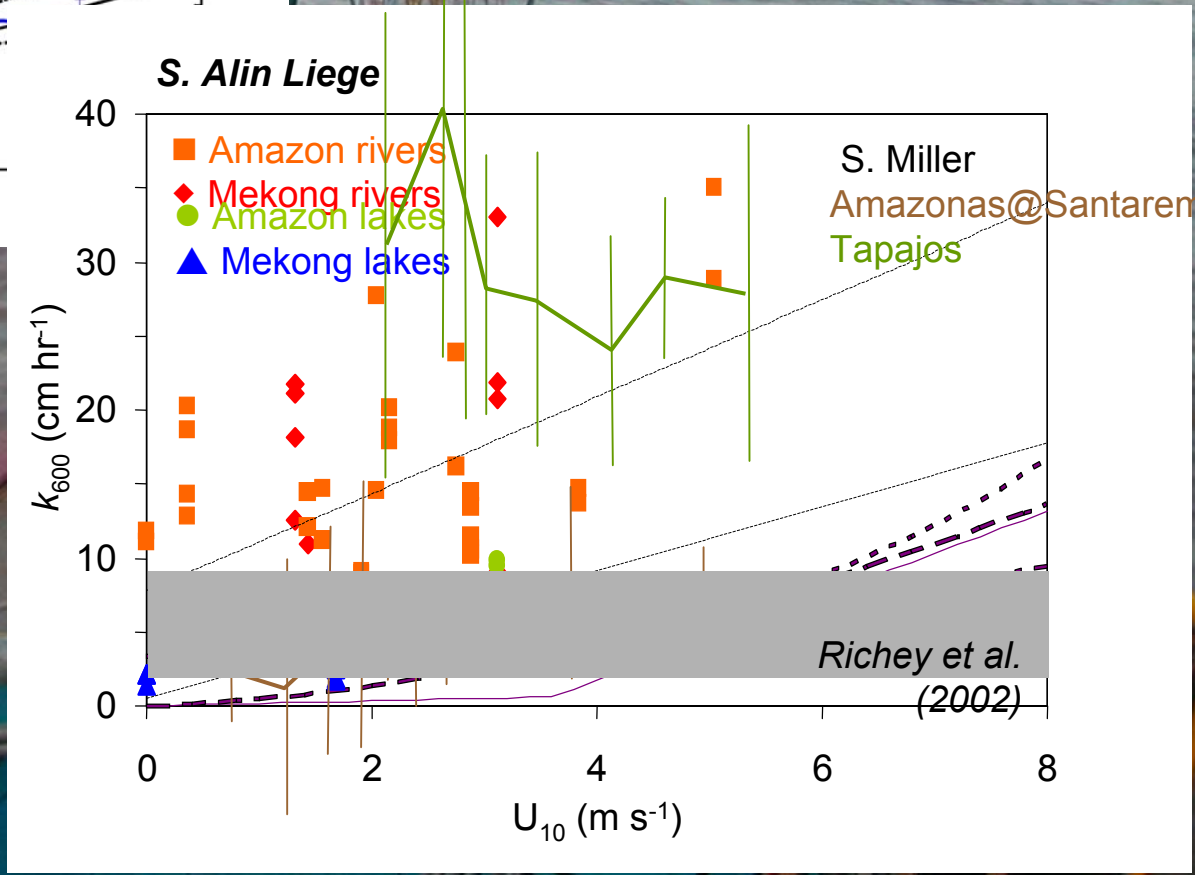
Forested Ultisol
Southern Amazon, Juruena, MT

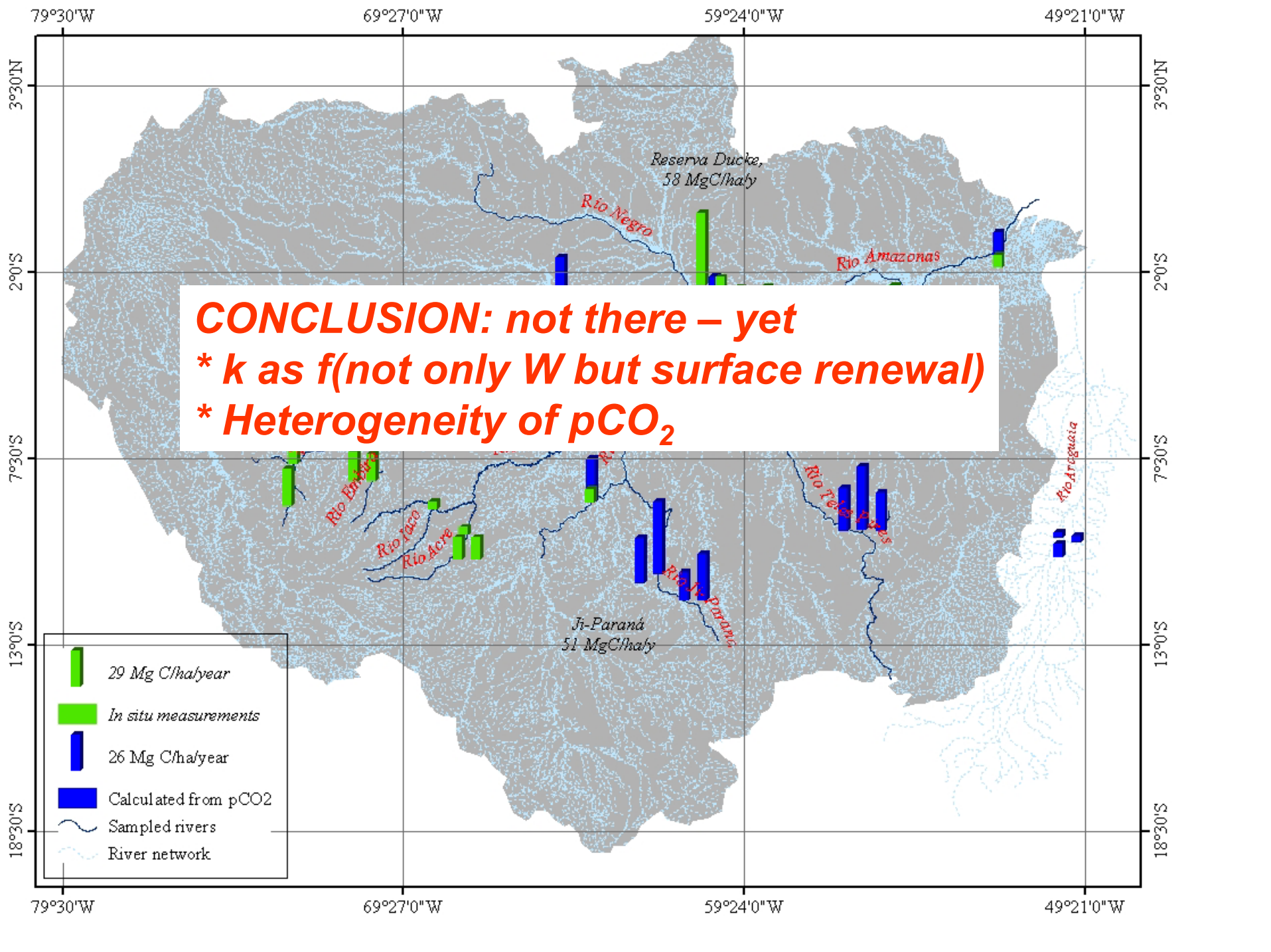
Isotopic Constraints on Carbon Cycling



E. Mayorga & Seus Amigos *Nature* (2005)


Transfer Velocity versus 10-meter Wind Speed (river data not adjusted for Schmidt #)
SCOTT MILLER et al
Wanninkhof (1992)
Jacobs et al. (1999)
McGillis et al. (2001)
AMAZON
TAPAJOS
k600 cm hr-1
U10


S. Alin Liege
Amazon rivers
Mekong rivers
Amazon lakes
Mekong lakes
S. Miller
Amazonas@Santarem
Tapajos
Richey et al.
(2002)
k600 (cm hr-1)
U10 (m s-1)



CONCLUSION: not there – yet

*** k as f(not only W but surface renewal)**

*** Heterogeneity of pCO_2**

LARGE WETLANDS RESEARCH NEEDS
Melack, SSC, 2003

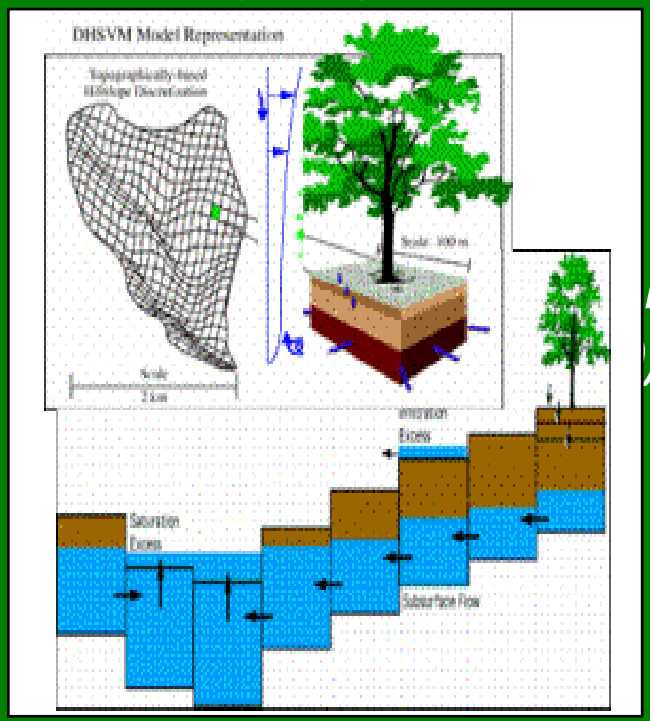
Process-based models

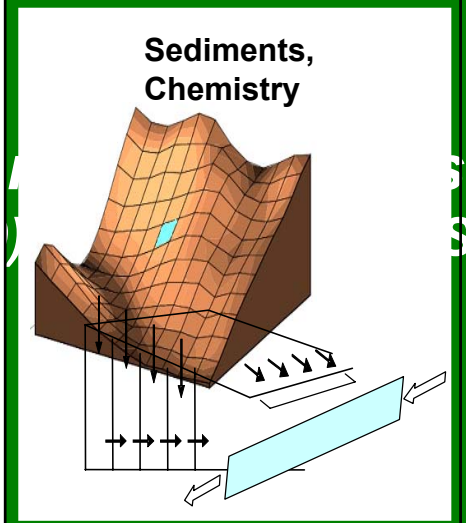
Ecological studies and methane emission measurements

Seasonally flooded savannas
Floodplains in eastern Peru
Interfluvial wetlands in upper Negro basin
Freshwater wetlands in Amazon delta
Riparian zones of streams

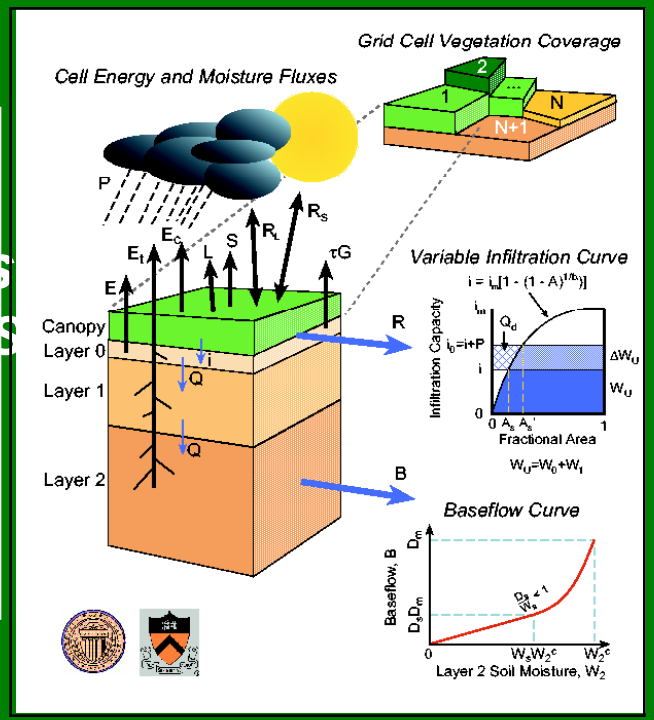
(Working towards being) based on Geospatial Hydrology/Landscape Models

DHSVM (Distributed Hydrology Soil Vegetation Model) Micro/Mesoscale Landscape/Hydrologic Model



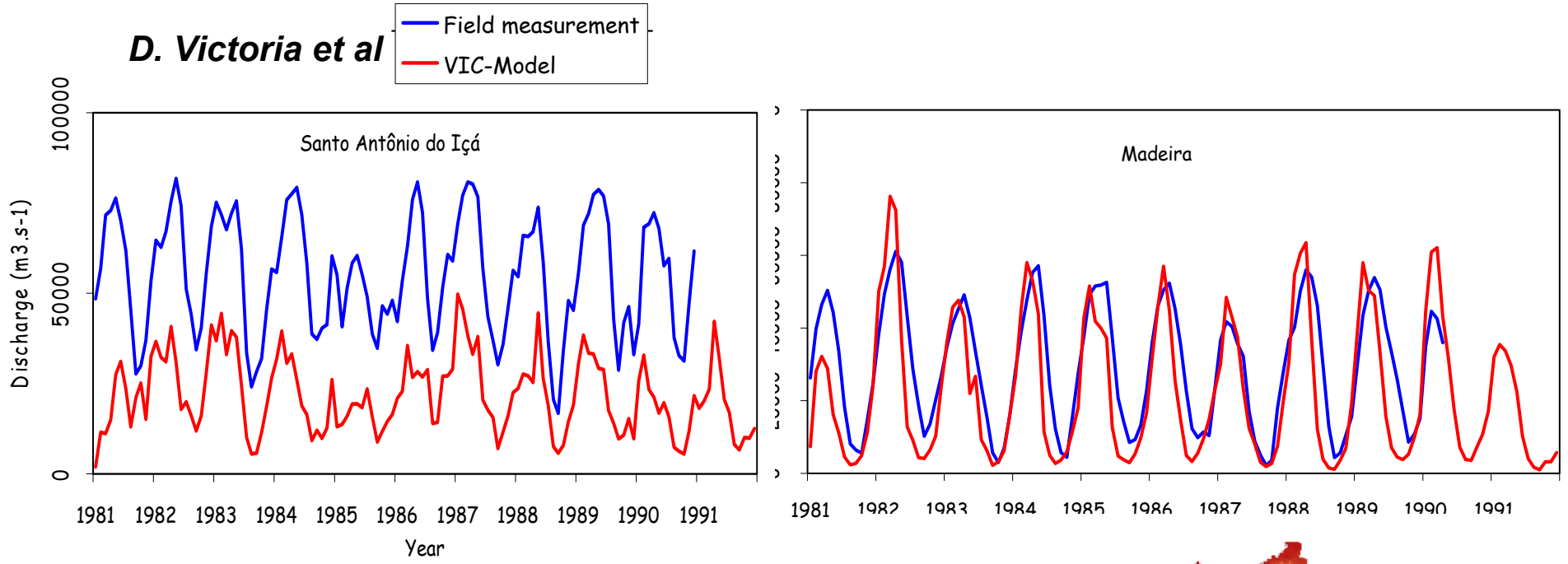


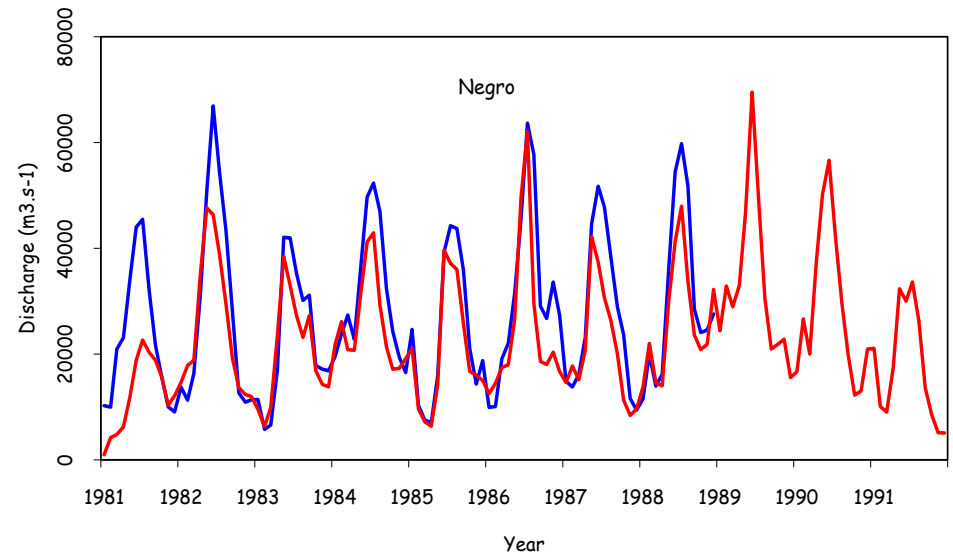
VIC (Variable Infiltration Capacity) Meso/Macroscale Landscape/Hydrologic Model

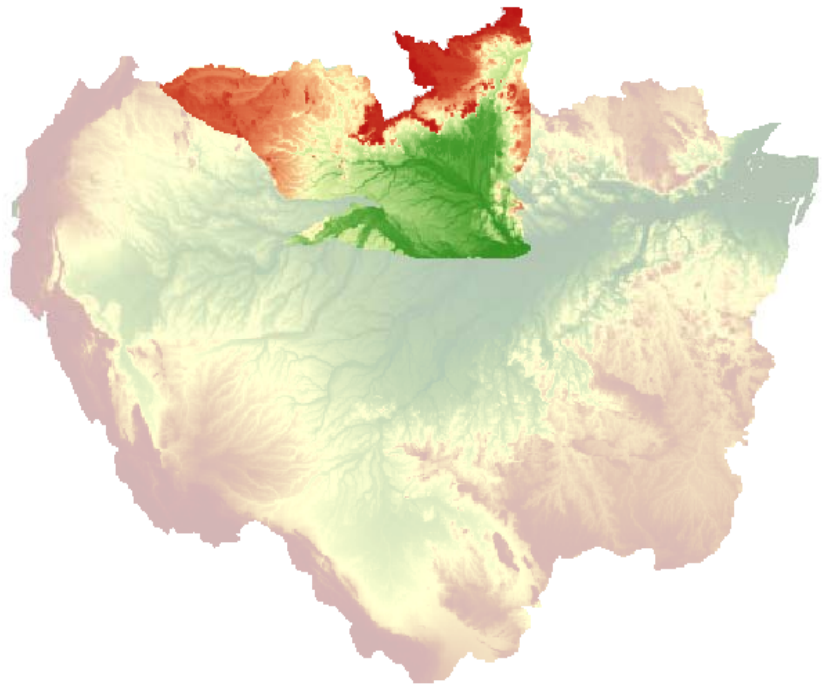


….and, of course, Coe, Costa, Howard et al

D. Victoria et al



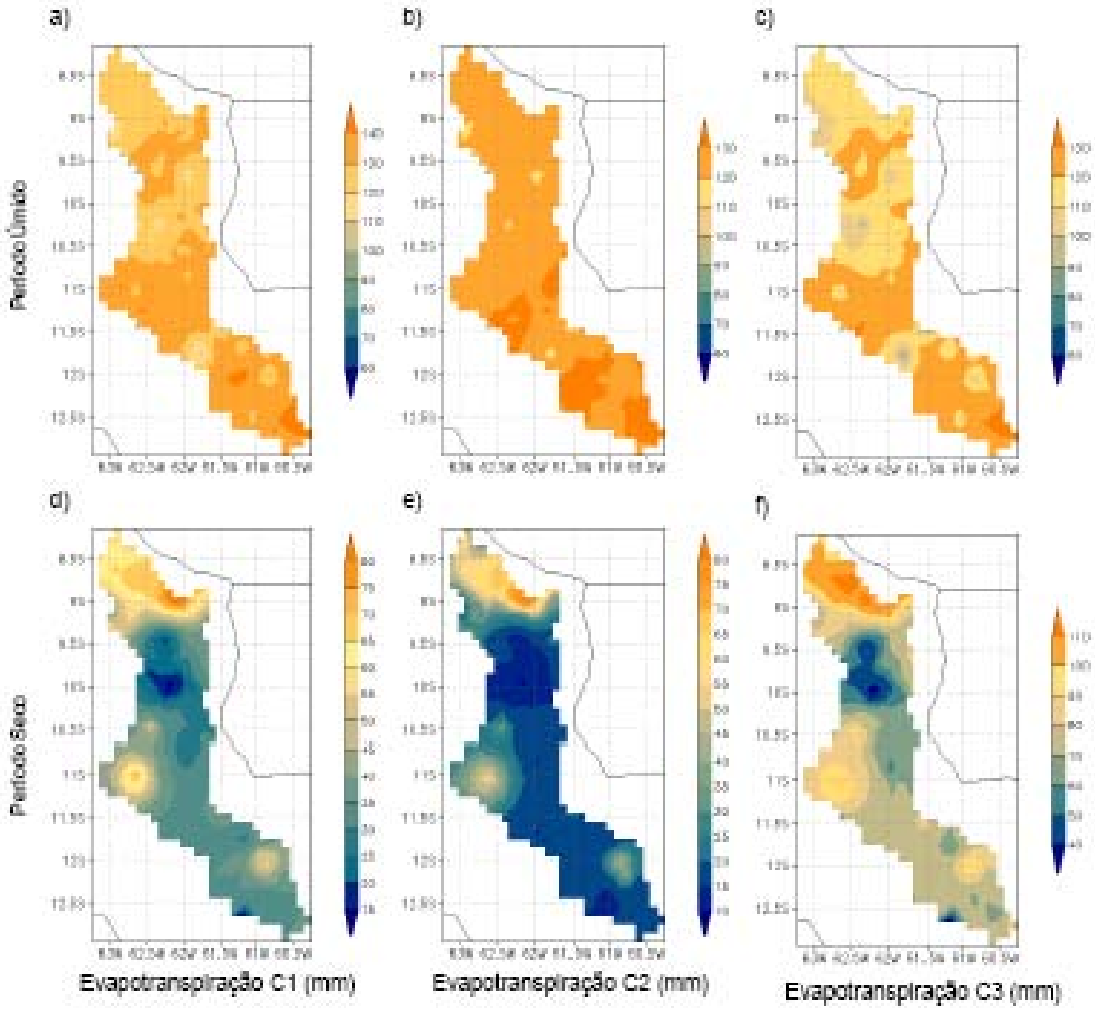




Modeled evapotranspiration for 3 scenarios:
C1 – Pasture
C2 – Soybean
C3 – Forest

Wet season

Dry season



Santiago, 2005

So how do we connect the dots" – do the integration and up/(down)-scaling?

- **Technical Issues**
- **Collaboration/ Facilitation Issues (i.e. "people")**

Collaboration Issues

With new technology comes the opportunity to address issues which inhibit collaboration between individuals or research groups. The potential for collaboration improves when the cyber infrastructure portrays a solution with as little cost to the individual. We believe that a successful information system directly addresses the following issues:

- Different groups use different analysis packages;
  - Because different users require data formatted for their choice of software, collaboration is restricted when transforming the data is required.
- Learning new software requires expenditure of time and effort;
  - Extending a well understood software application to use new types of data will maximize an individual's time and effort.
- Centralized data repositories cannot support works in progress;
  - With direct access to the most current version of all data other users are not limited to an archived version or required data.
- It takes too long to rewrite an existing (in-house) application to accept new data structures.

Modelers rarely know much about "chemistry." And certainly few biologists /chemists know much about (serious) modeling (especially at E&T level…)

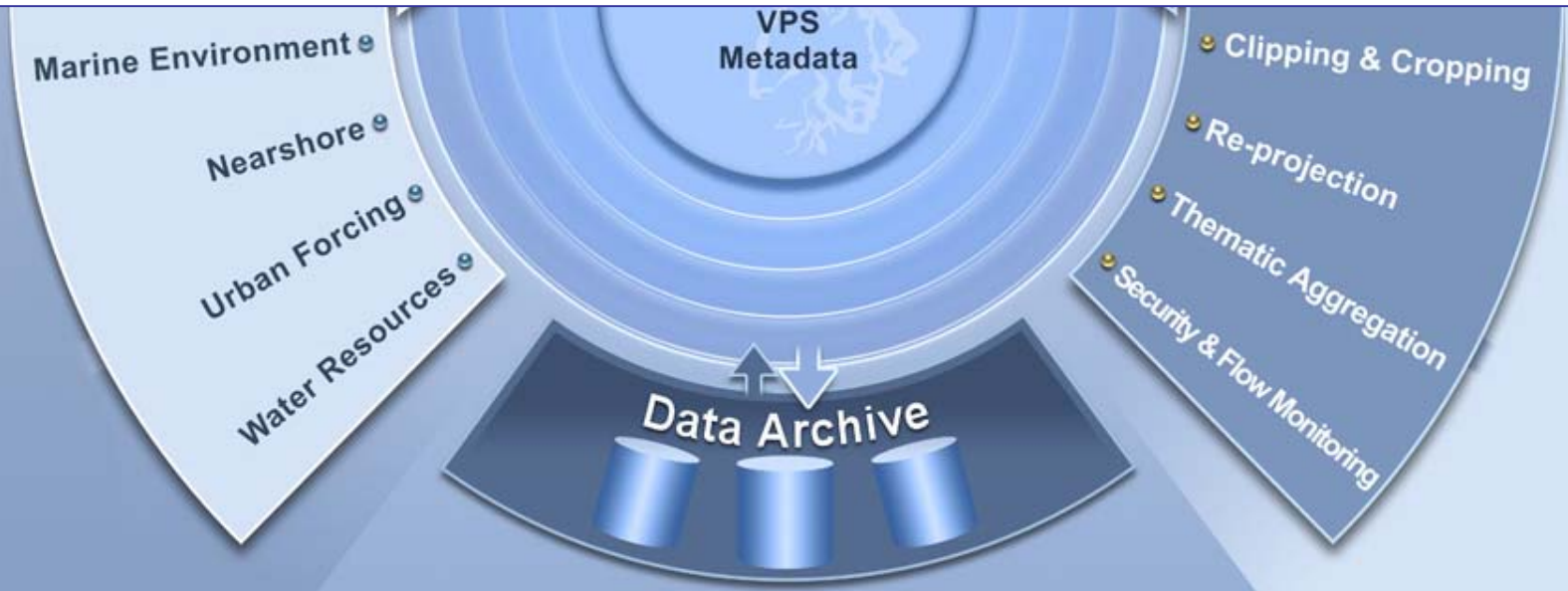
Virtual Scaleable Basin

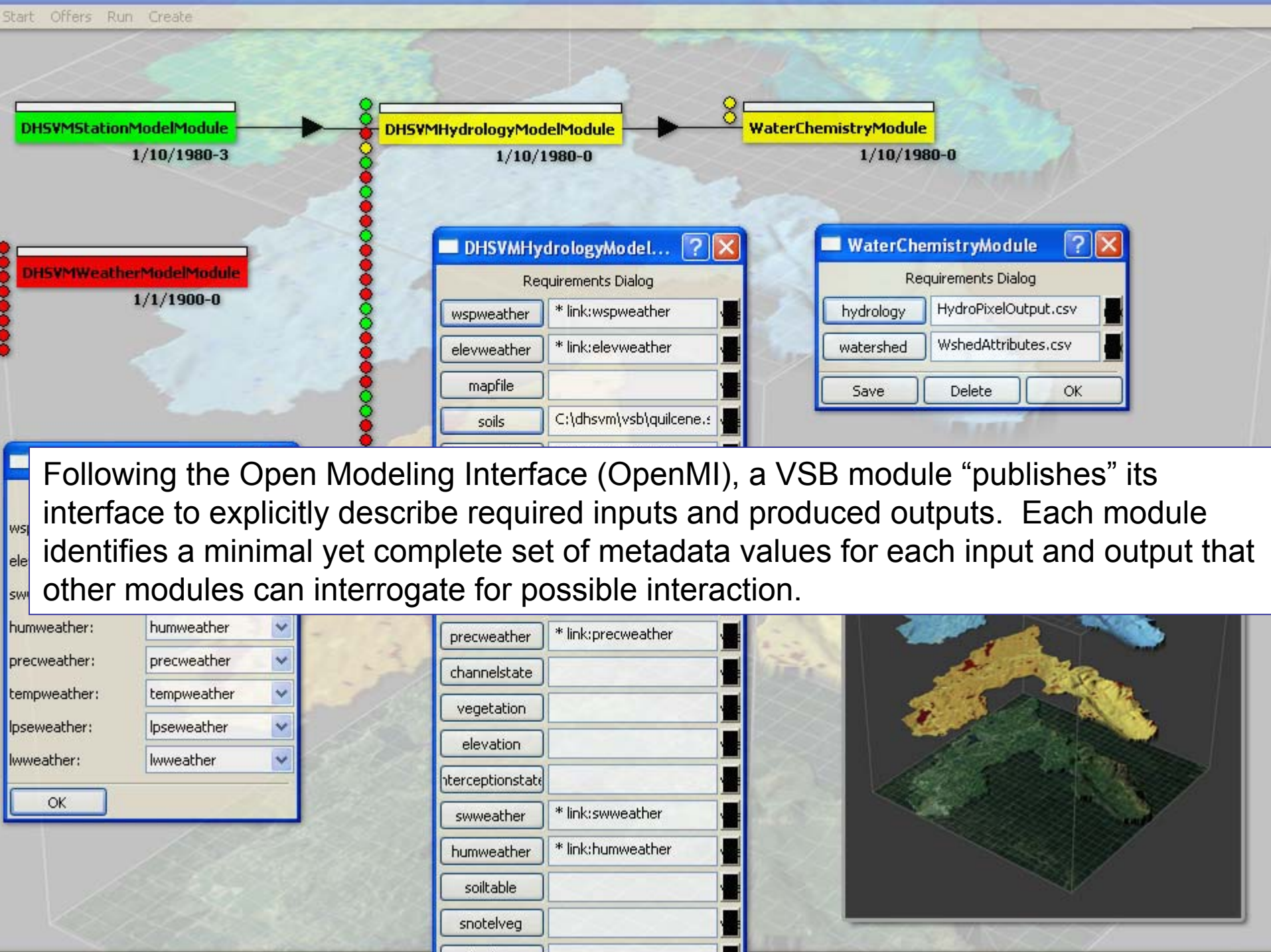
Analysis for the Multi-Scaled Biophysics and Human Dimensions in a Collaborative Land/Atmosphere/Marine System

M. Logsdon, J. Richey, B. Campbell, M. Stoermer, H. Hadaway
University of Washington, School of Oceanography

The Virtual Scalable Basin (VSB) work attempts to make simulation modeling more flexible in order to:

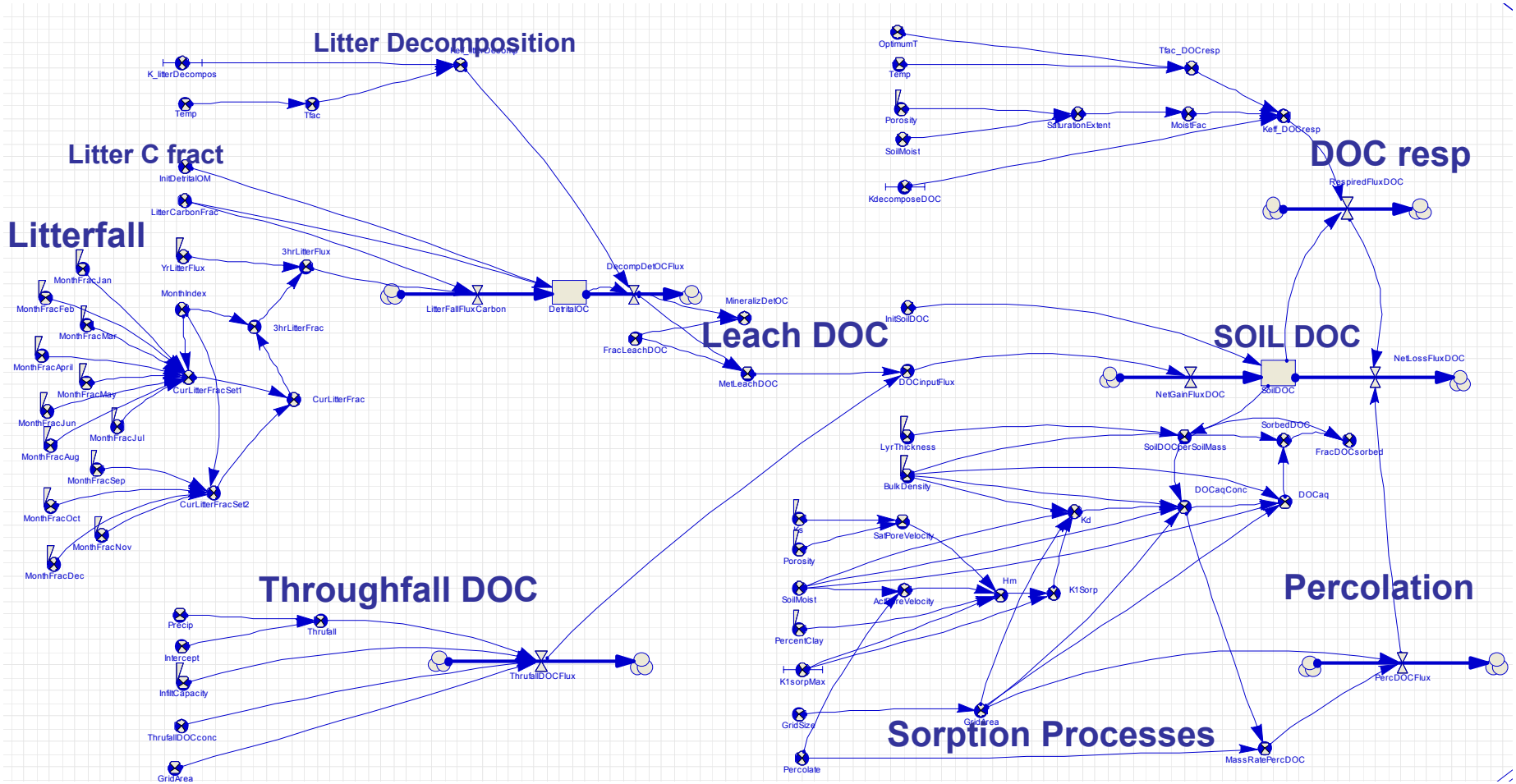
* more easily integrate useful input data sets.
* more easily expand calculation for attempting more complex simulation objectives.
* more easily develop new simulation modules for participation in modeling runs (thus facilitating collaboration)
* take advantage of cutting-edge visualization tools including runtime visualization facilities.
* more easily facilitate the sharing of useful output data sets.





Following the Open Modeling Interface (OpenMI), a VSB module “publishes” its interface to explicitly describe required inputs and produced outputs. Each module identifies a minimal yet complete set of metadata values for each input and output that other modules can interrogate for possible interaction.

DOC_Soilyr0



Tambem: NO_3, CO_2, NH_4

Porranee Rattanaviwatpong

2005-2006

Task 1. Integration Workshops (#1 late March, 2006; ~Aguas da Sao Pedro)

Task 2. Complete and Integrate Cross-System Field Data into VSB

Task 3. Establish the Virtual Scaleable Basin (VSB) Modeling and Informatics Infrastructure.

Development of Fine-Scale Solute Export Model
Scaling Hydrology Models
Determination of Surface Forcing.
Incorporate NPP Module