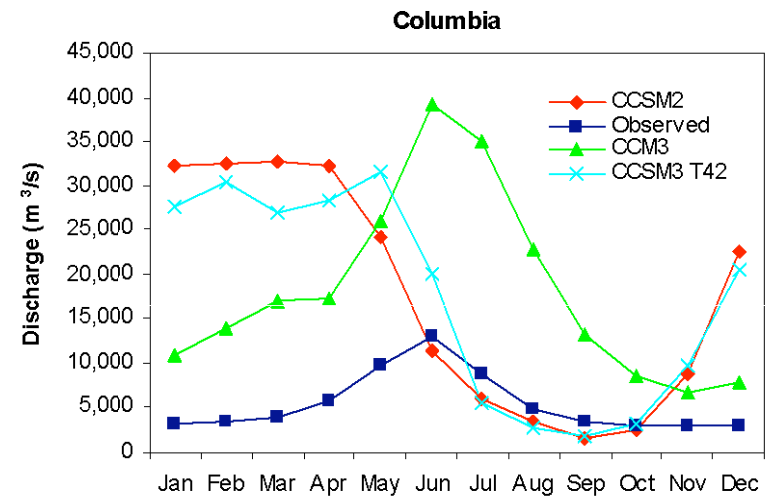
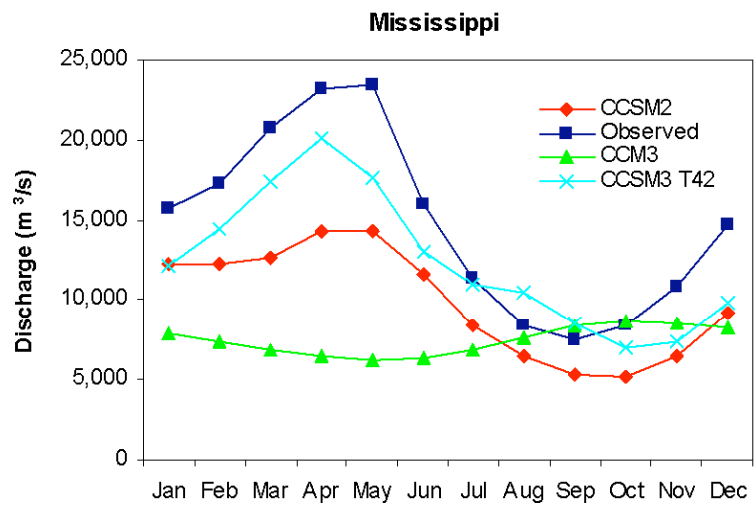
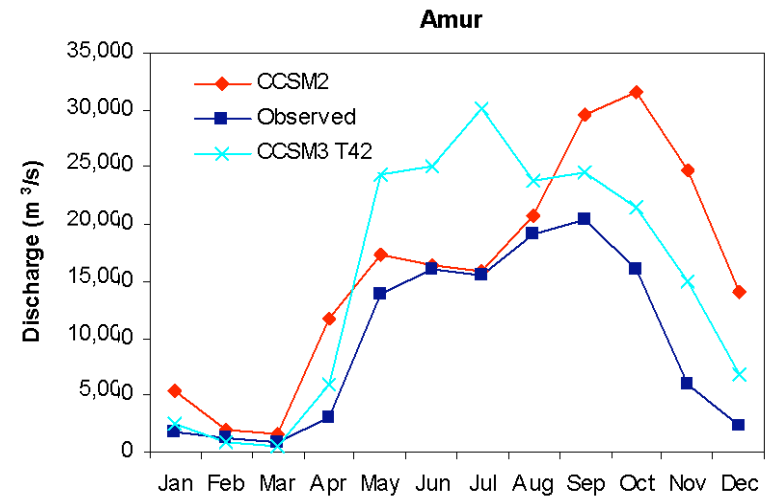
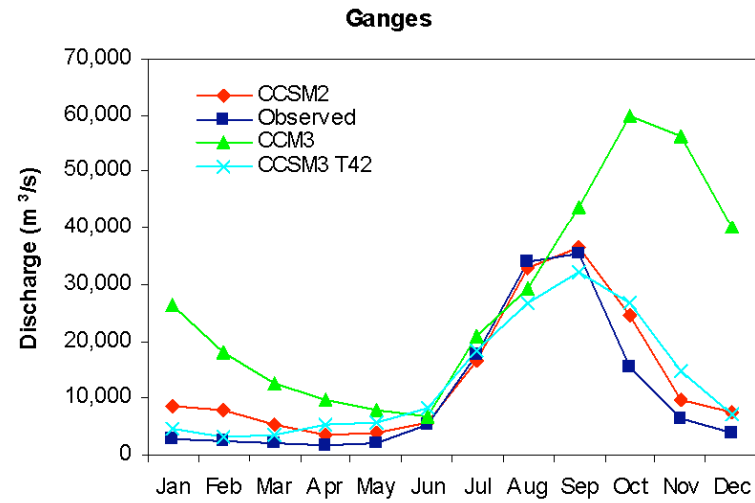


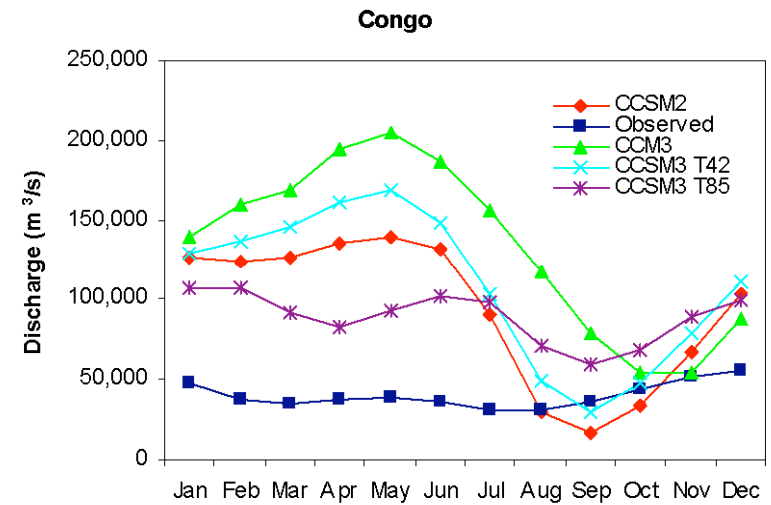
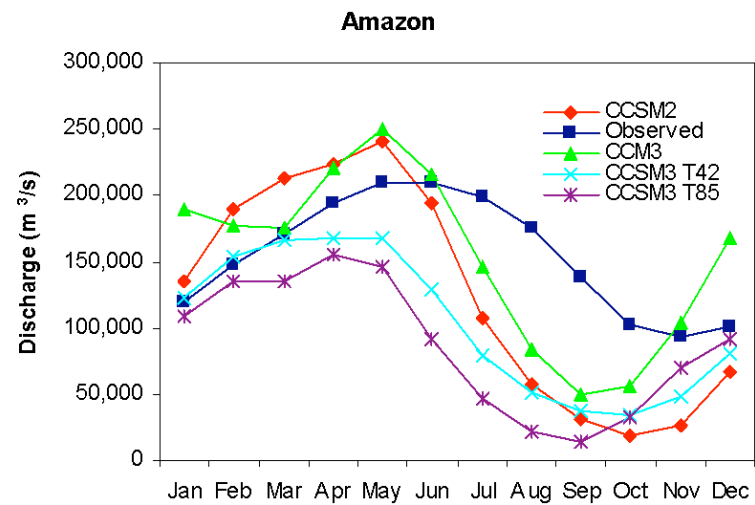
Climate modeling at ORNL

**David Erickson
Climate and Carbon Research Institute
Computer Science and Mathematics Division
Oak Ridge National Laboratory**

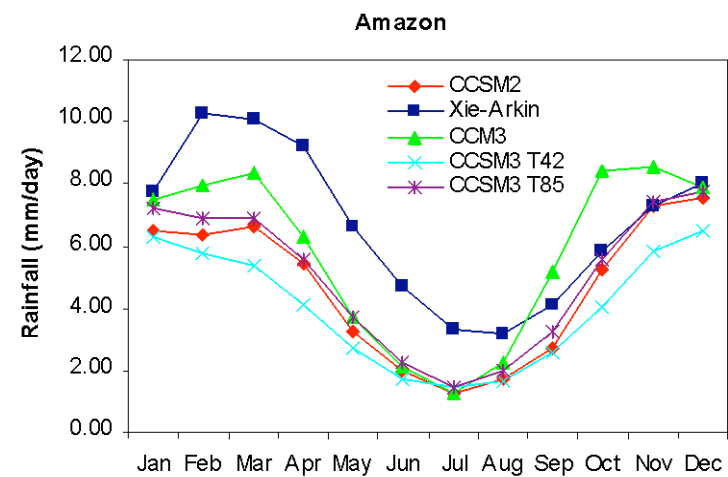
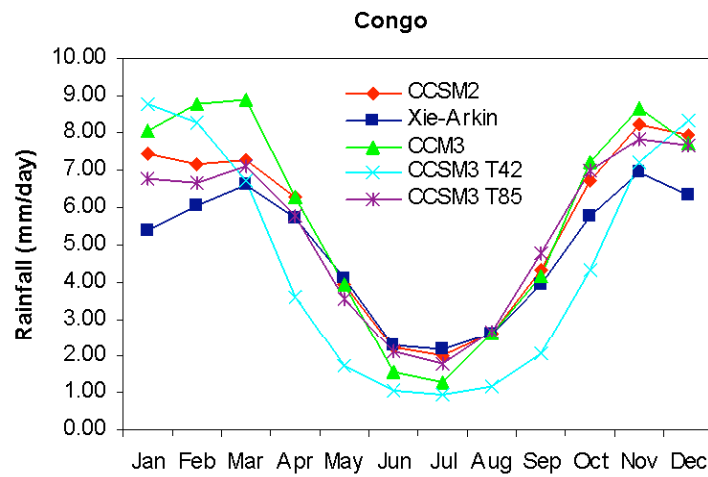
Dec. 12, 2005



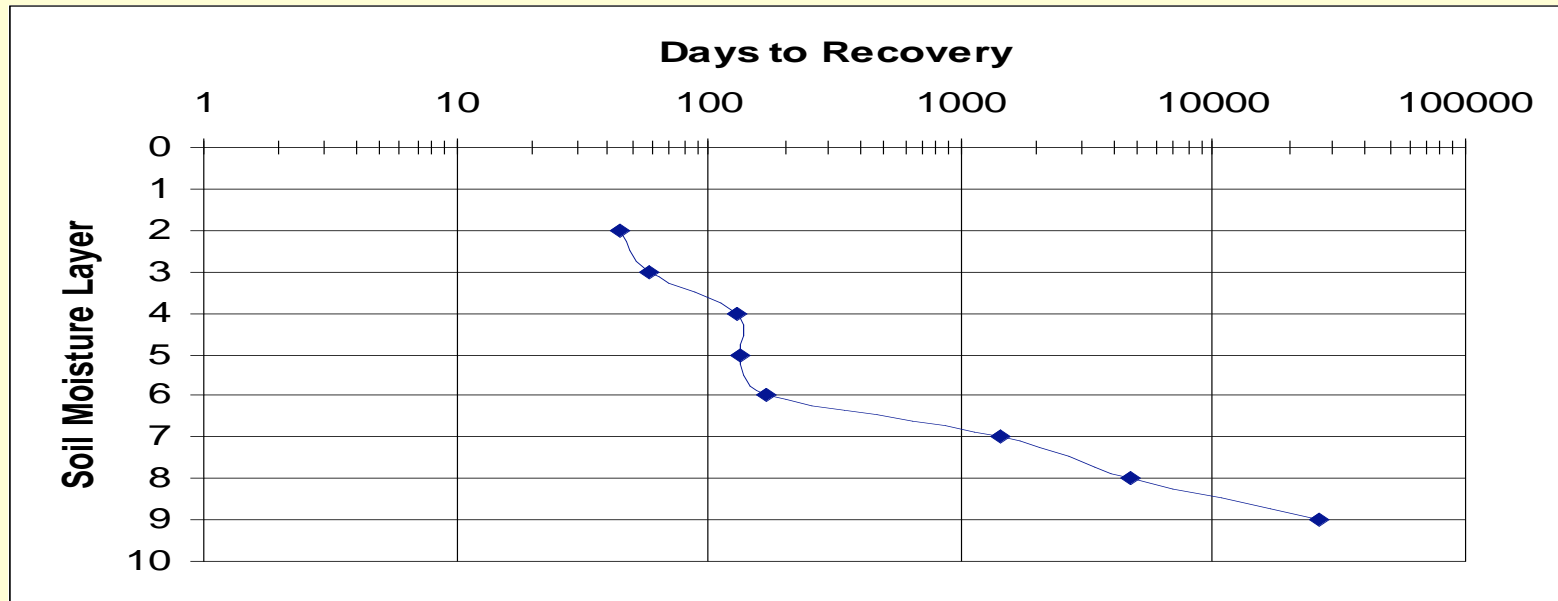
Monthly Hydrographs from CCSM



Rainfall in CCSM

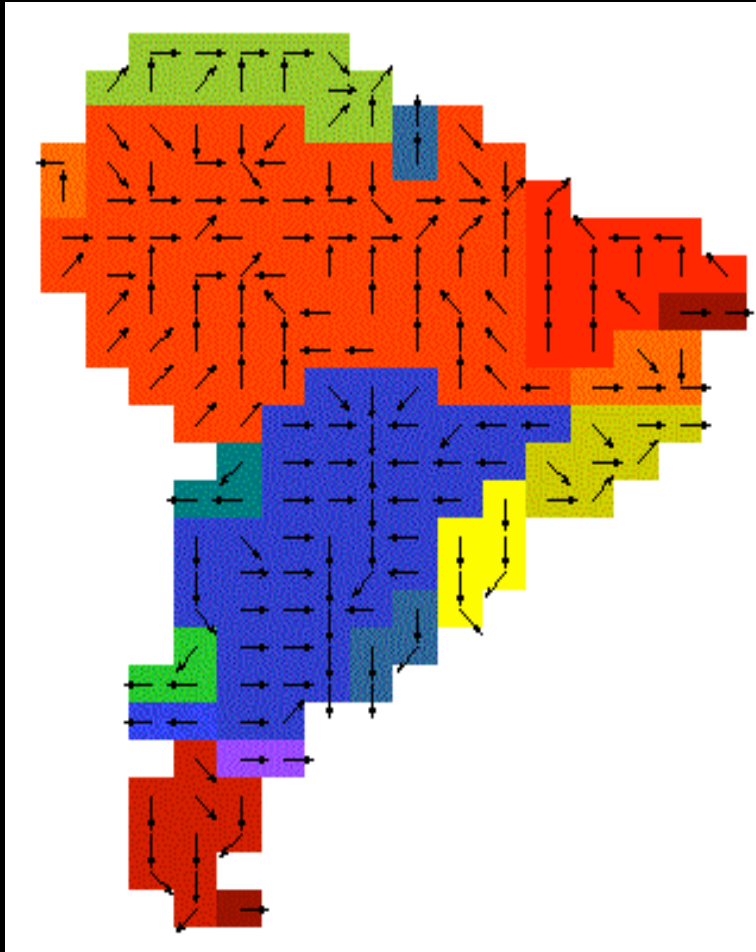


Time for Soil Moisture to Recover to Control Conditions



- Top and bottom levels excluded
- Levels 8 and 9 extrapolated from pattern during first nine years

Cell to Cell Routing



Mass balance on a cell
(after Vorosmarty et al. 1989)

$$\frac{dS}{dt} = \sum F_{in} - F_{out} + R$$

S = storage of river water within cell

F = flux of river water entering/leaving a cell

$$F = KS$$

$$K = v/d$$

v = flow velocity

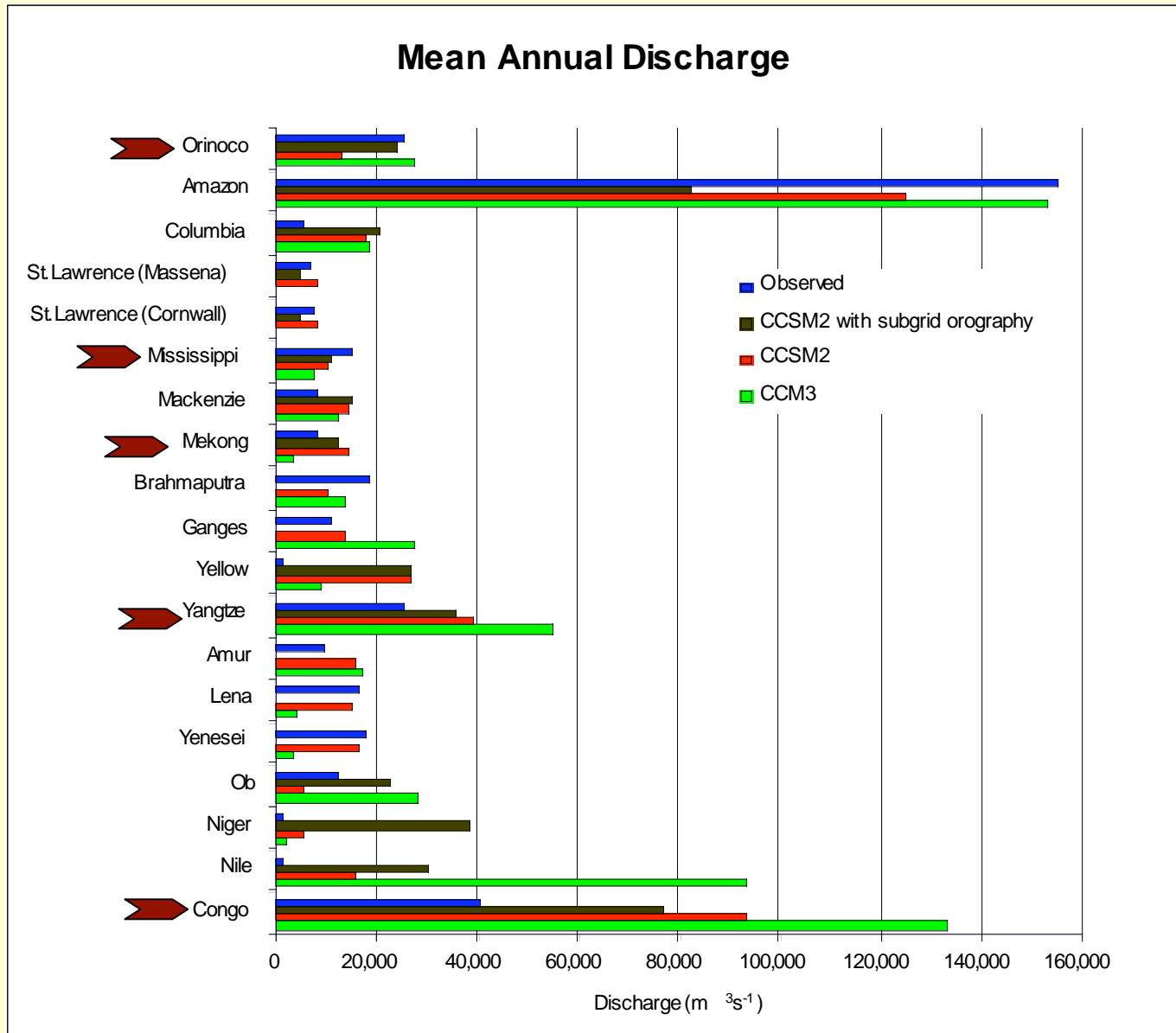
d = distance between centers of

cells

in downstream direction

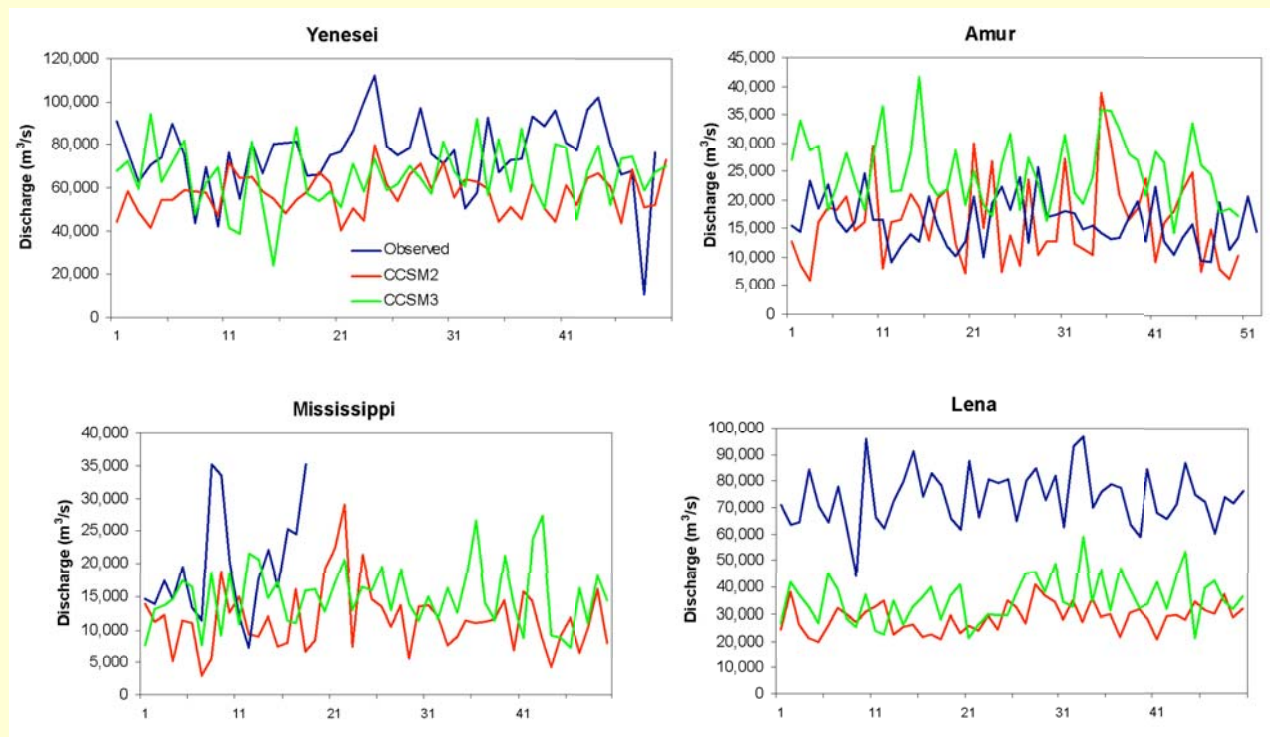
R = runoff generated within cell

F_{out} routed according to flow direction map

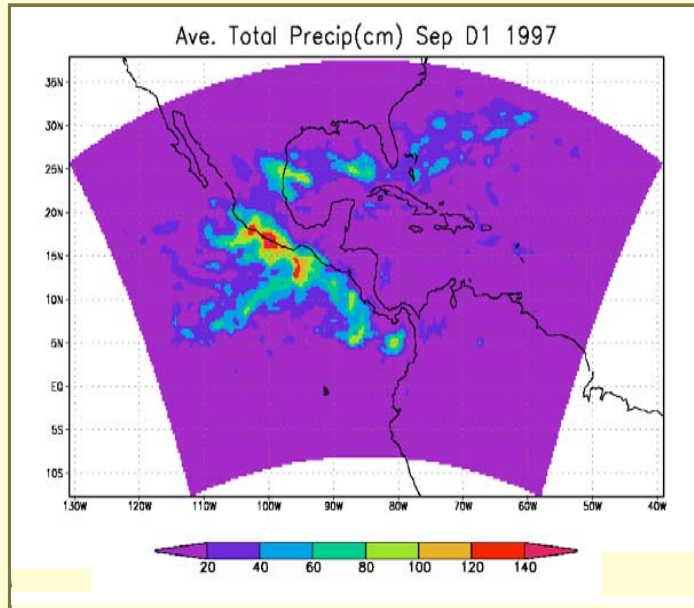


Arrows denote rivers that showed improved accuracy with subgrid orography.

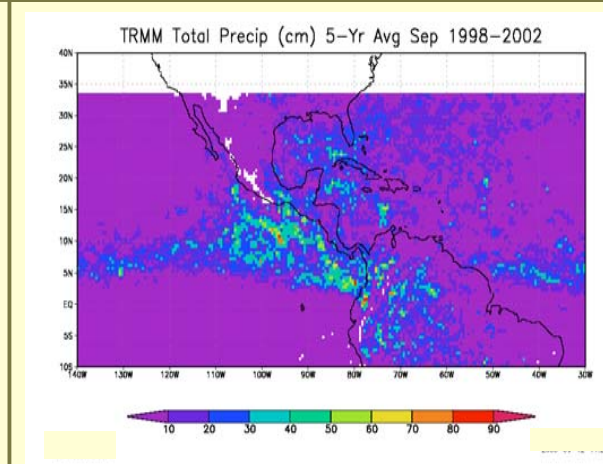
Time Series of River Discharge from CCSM



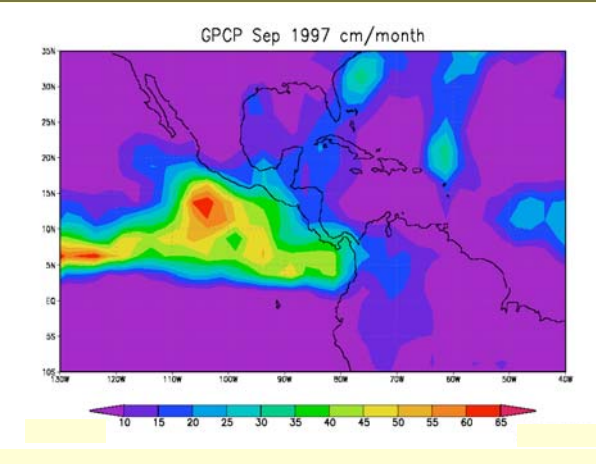
Evaluating MM5 Model Simulated Precipitation Over Central America Using TRMM



- Model run at 60 km resolution does a reasonable job simulating wet season precipitation
- High resolution TRMM data essential for evaluating model precipitation: spatial and vertical structure, orographic effects, land surface / SST contrast controls on convection



TRMM Precipitation; Sept. Avg.
1998-2002 (0.5 deg res, ~55 km)



Global Precipitation Climatology
Project (2.5 deg res; ~ 260 km)

Summary of research opportunities

- Global climate modeling
- Regional climate modeling
- Atmospheric chemistry
- Biogeochemistry (carbon cycle)
- Statistical analysis of observations and model data