

## GIS

### Connecting Hydrology and Meteorology

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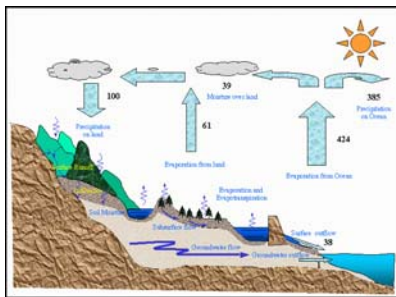
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## Outline

- Using GIS to connect hydrology and meteorology

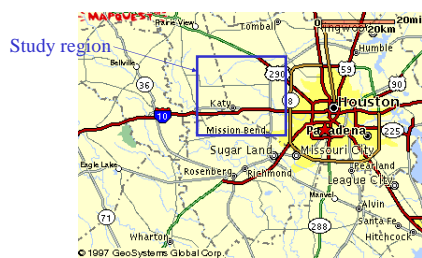
### Hydrologic Cycle: Connecting the Land Surface with the Atmosphere



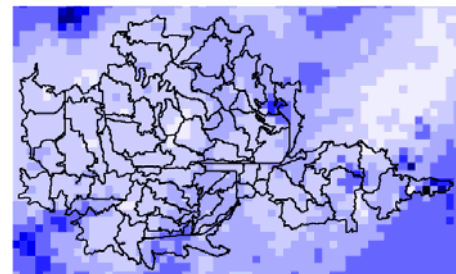
### Connecting Hydrology and Meteorology

- Two Spatial Scales
  - Drainage basin scale for consideration of severe storms and flood (Nexrad radar precipitation as input, flood runoff as output)
  - Regional or global scale for consideration of climate change (Global climate models as input, time series of river flows as output)

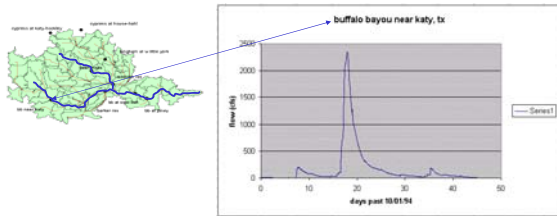
### Regional flood analysis in Houston



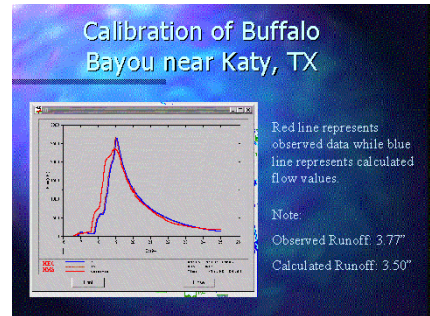
### Nexrad Rainfall for Storm of Oct 1994



## Discharge in Buffalo Bayou at Katy October, 1994 storm



## Calibrated Flow with HEC-HMS

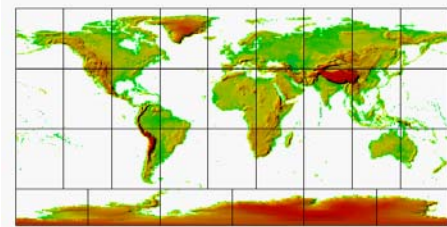


## Global Runoff (mm/yr)



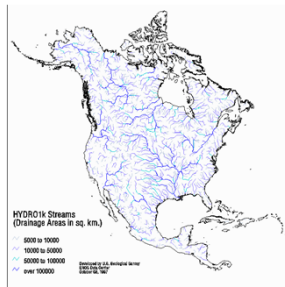
According to NCAR's CCM3.2 Global Climate Model (GCM)

## GTOPO30 - 30'' Digital Elevation Model of the Earth



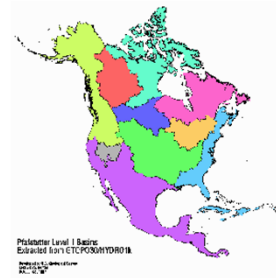
Source: <http://edcwww.cr.usgs.gov/landdaac/gtopo30/gtopo30.html>

## Drainage in North America



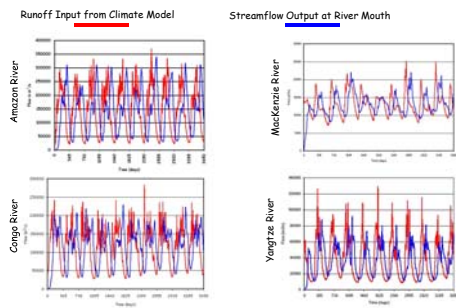
Source: <http://edcwww.cr.usgs.gov/landdaac/gtopo30/hydro/namerica.html>

## Drainage Basins of North America



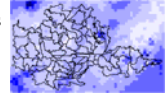
Source: [http://edcwww.cr.usgs.gov/landdaac/gtopo30/hydro/na\\_basins.html](http://edcwww.cr.usgs.gov/landdaac/gtopo30/hydro/na_basins.html)

## Streamflow Hydrographs for Large Basins



## A Fundamental Dilemma

- Land Surface Hydrology has:
  - drainage patterns organized by rivers and watersheds which are **spatially discrete**
  - analysis in **Cartesian coordinates** ( $x, y, z$ )
- Atmospheric Science has:
  - circulation patterns which are **spatially continuous** over the earth
  - analysis in **Geographic coordinates** ( $\phi, \lambda, z$ )



GIS can be used to connect these two spatial frameworks

## Summary

- GIS is quite useful to connect hydrology and meteorology at different spatial scales