GIS
Connecting Hydrology and Meteorology

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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


Drainage in North America

Drainage Basins of North America

Source: http://edcwww.cr.usgs.gov/landdaac/gtopo30/hydro/namerica.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 \((\theta, \lambda, z)\)

GIS can be used to connect these two spatial frameworks

Summary

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