Bringing it all together

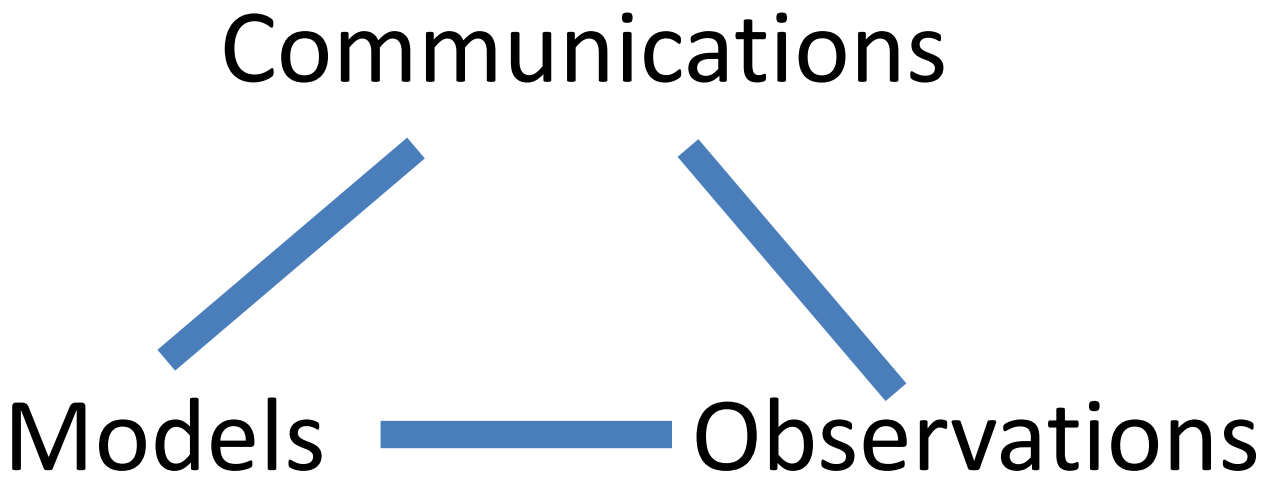
David R. Maidment
Texas Water Forum

13 February 2012

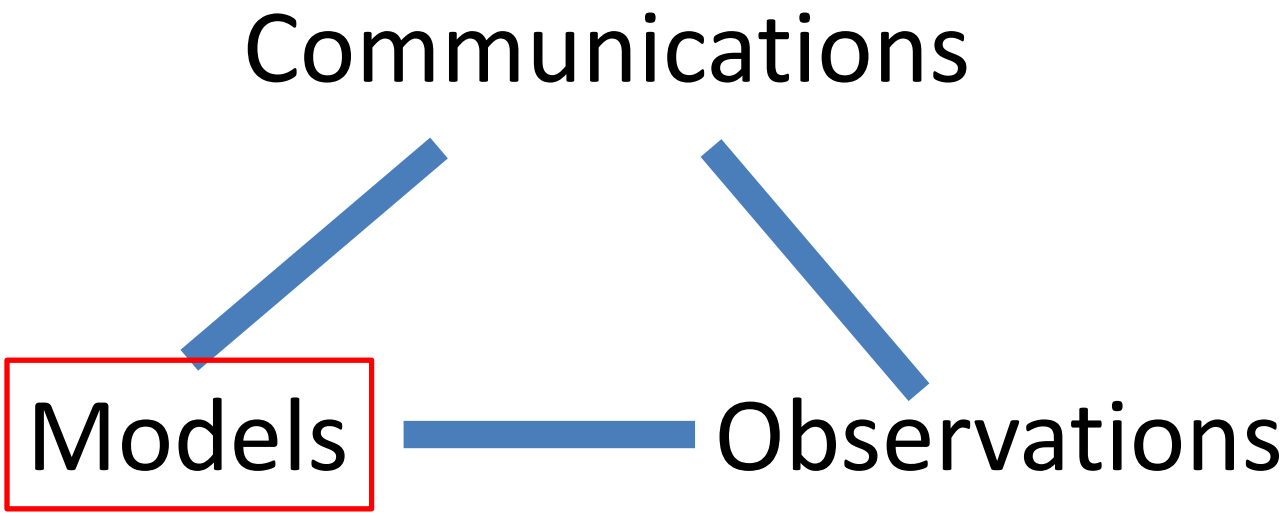
What have I learned today?

- Texas drought is very complex
  - On a physical level as to causes in the atmosphere and their translation into water conditions in the land surface and subsurface
  - On a biological level as to impacts on plant and animal life
  - On a human level as to impacts on water supply, power plant operations, air pollution

Texas Drought: Science, Data, Tools



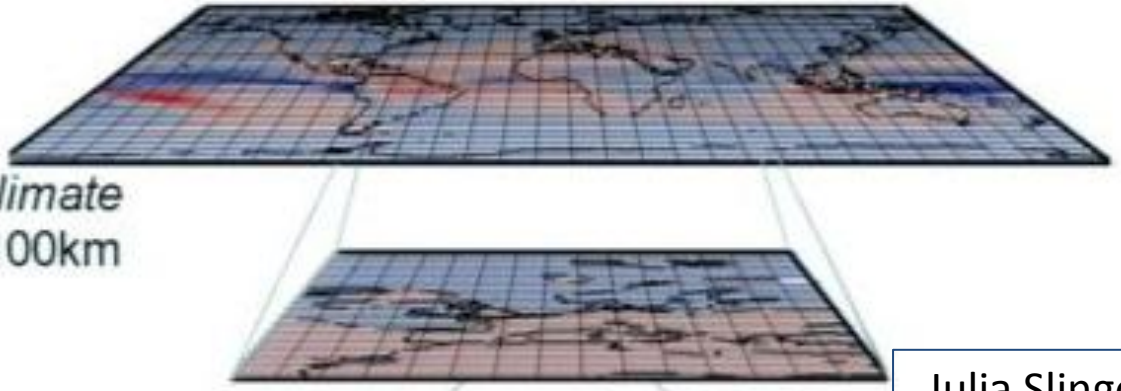
Texas Drought: Science, Data, Tools



Bridging the Gaps and Bridging the Scales

Met Office

Julia Slingo, Chief Scientist
United Kingdom Met Office



Global Weather/Climate Model: 25 -100km

Regional Weather/Climate model: 25 - 12km

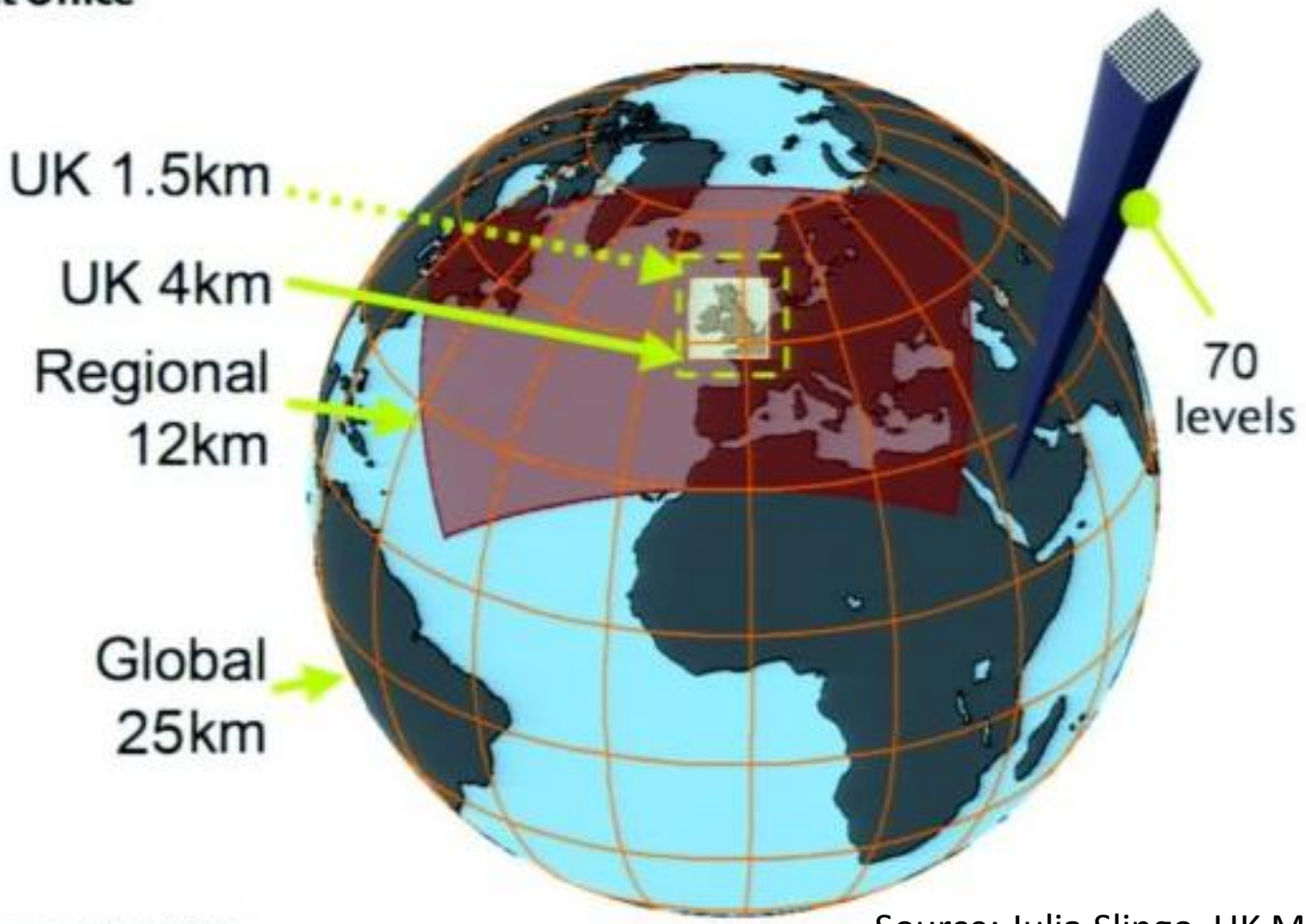
Regional Impacts Model: Hydrology, Vegetation, Topography

Local downscaling model: 4 - 1km

Local Decision-Making: Land use, Water use, Adaptive Responses

Operational Forecasting Models: Summer 2011

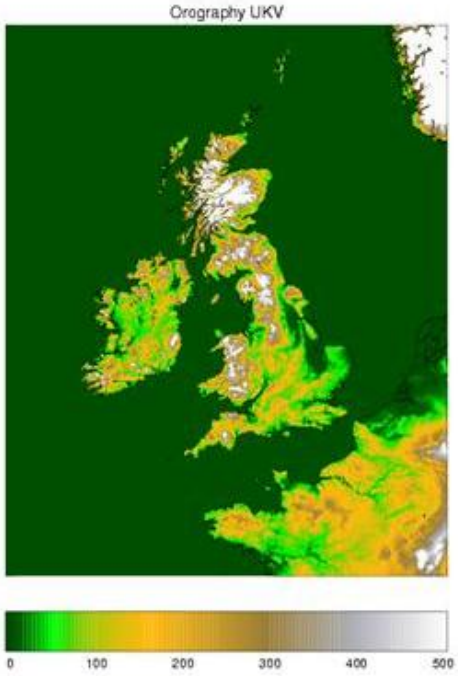
Met Office



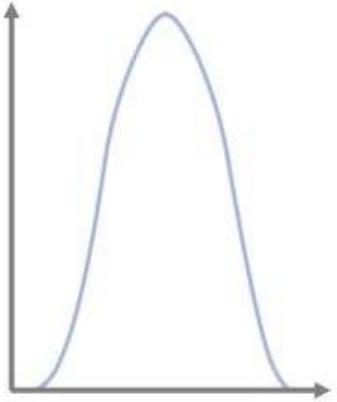
Source: Julia Slingo, UK Met Office

Ensemble Forecasting and Statistical Summary

N x Global predictions at ~20km with lead times of days to years



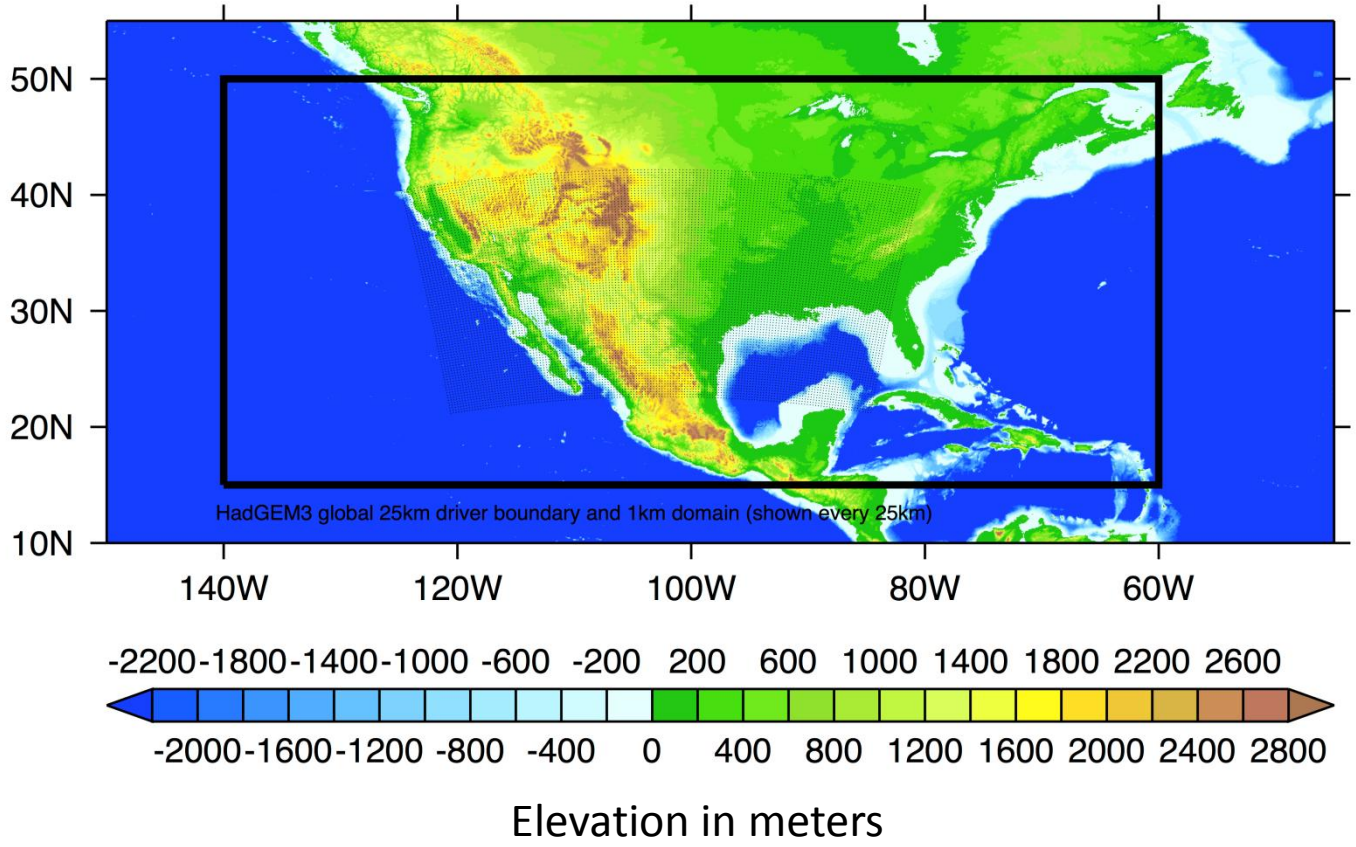
<N x Regional predictions at ~1km



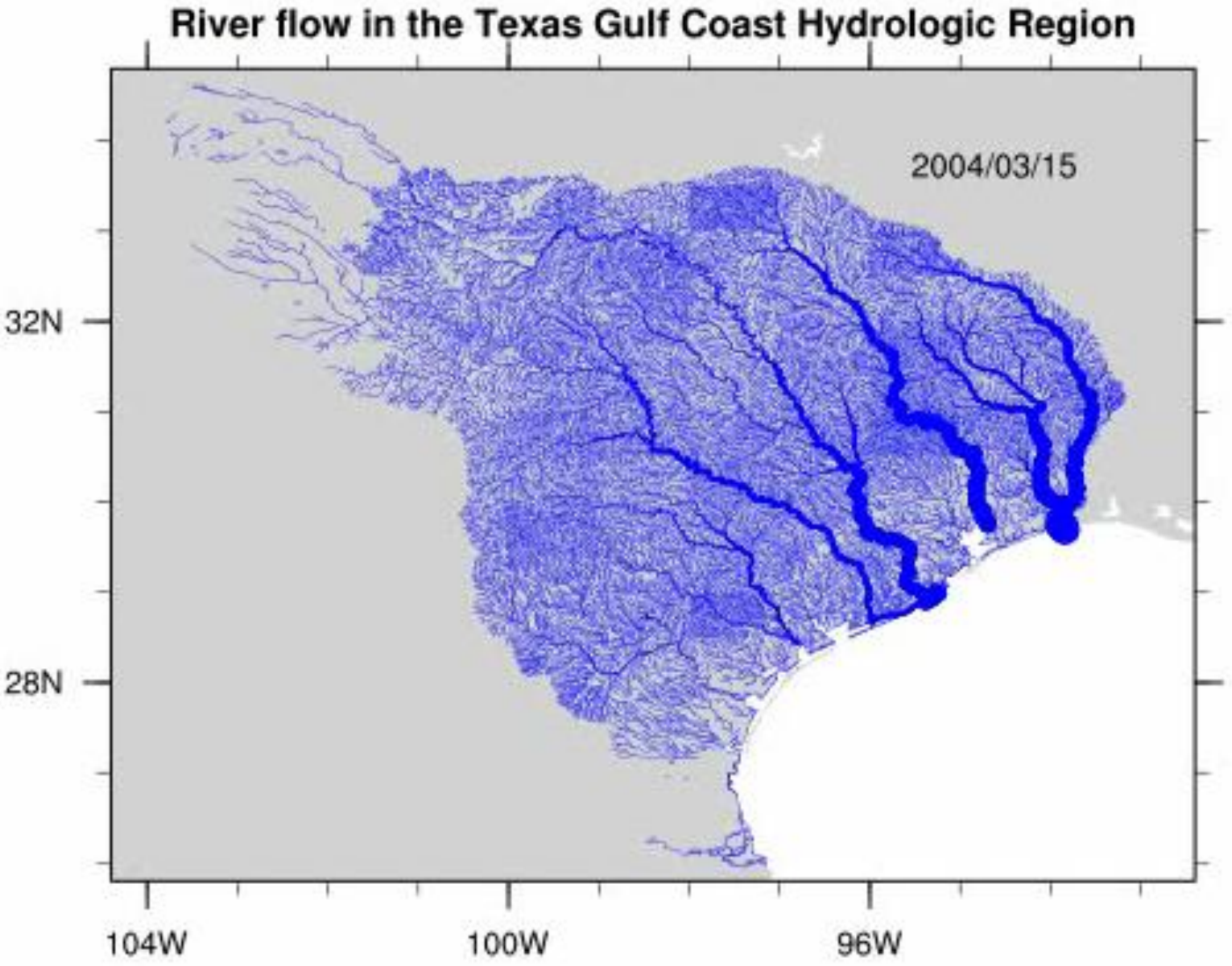
PDF of local hazard

Source: Julia Slingo, UK Met Office

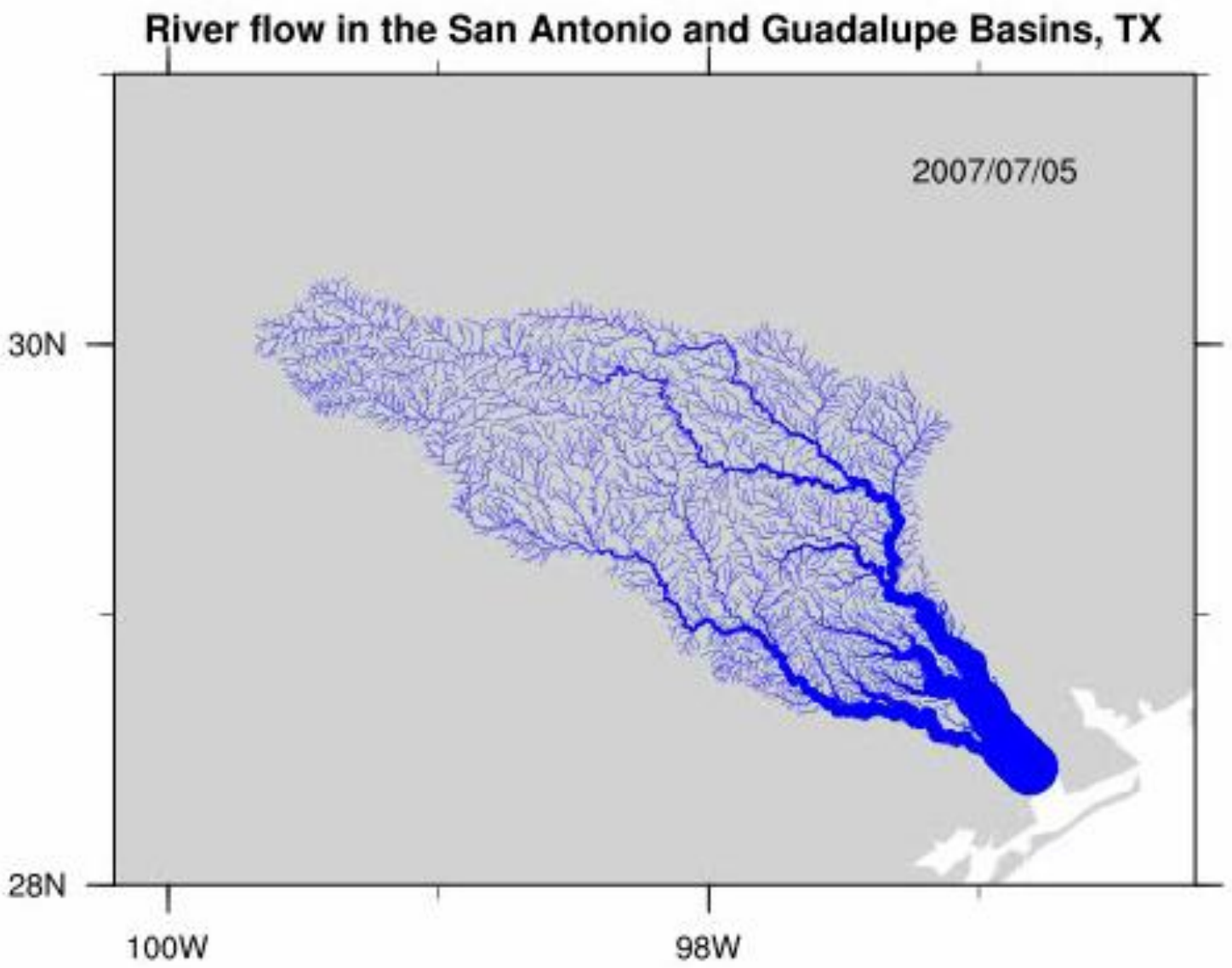
Proposed 1 km Simulation Domain for North America



Source: Pier Luigi, University of Reading



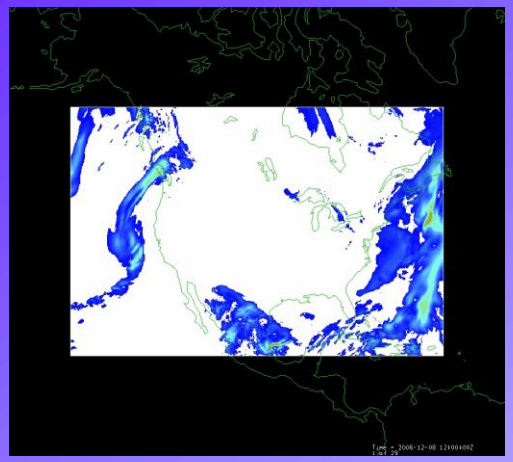
http://www.geo.utexas.edu/scientist/david/rapid.htm



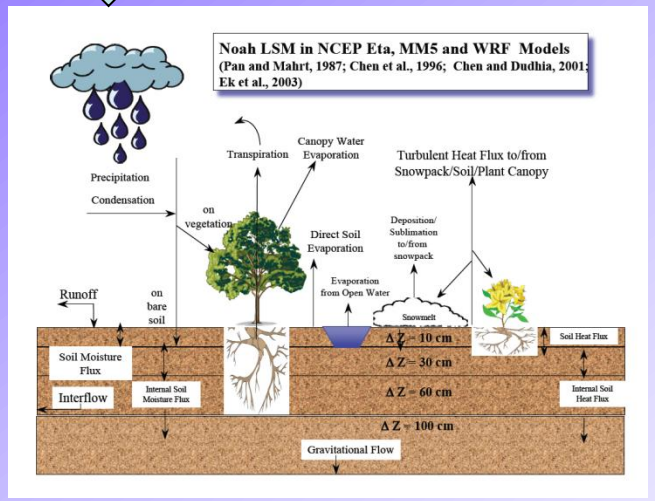
http://www.geo.utexas.edu/scientist/david/rapid.htm

David et al. (2011), Journal of Hydrometeorology, DOI: 10.1175/2011JHM1345.1

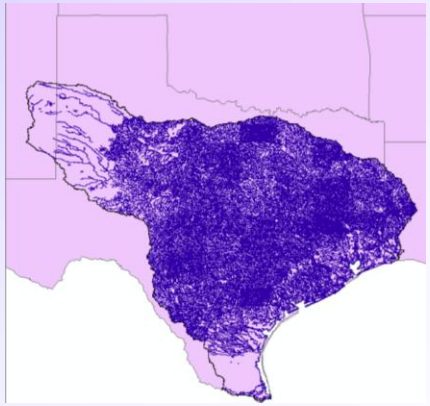
Integrated River Modeling



Atmospheric Model or Dataset

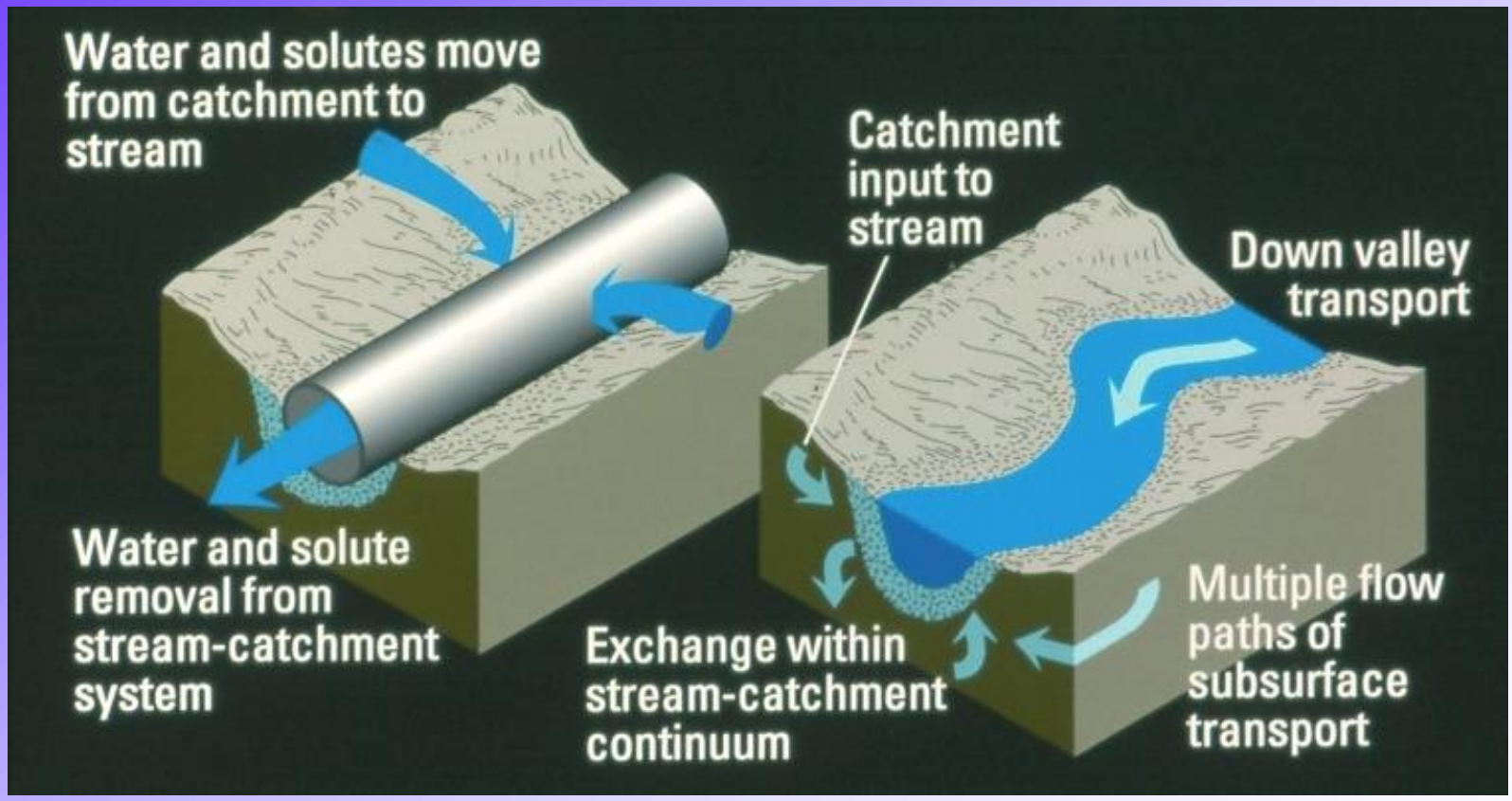


Land Surface Model

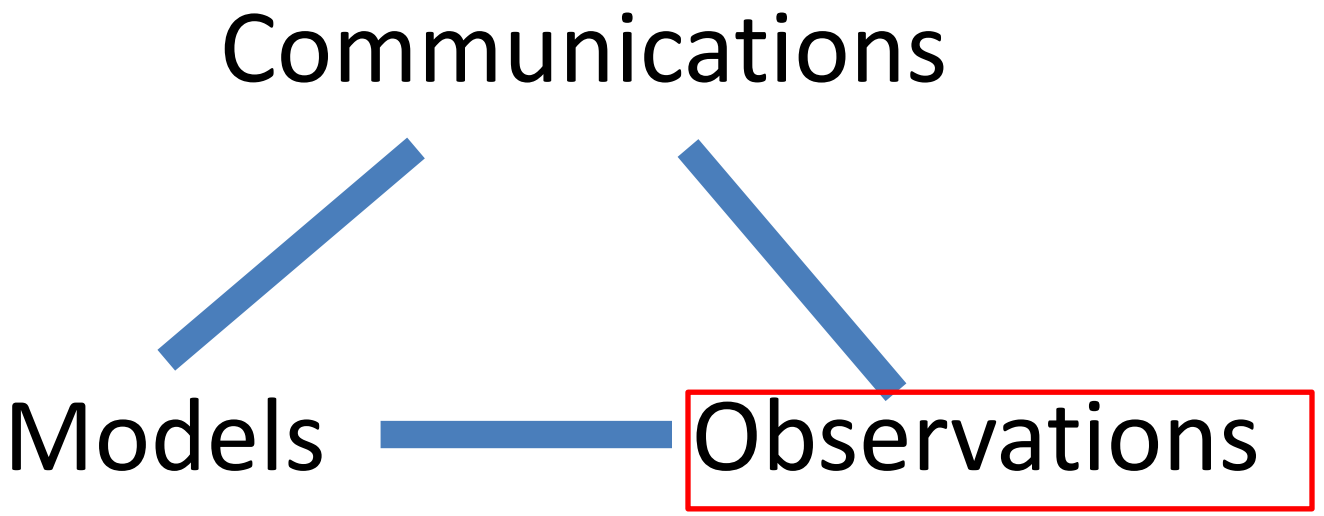


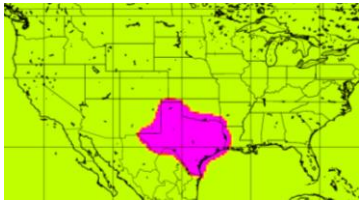
“Blue Line” River Network - High-Performance Computing River Network Model

We need to add Groundwatear!



Texas Drought: Science, Data, Tools



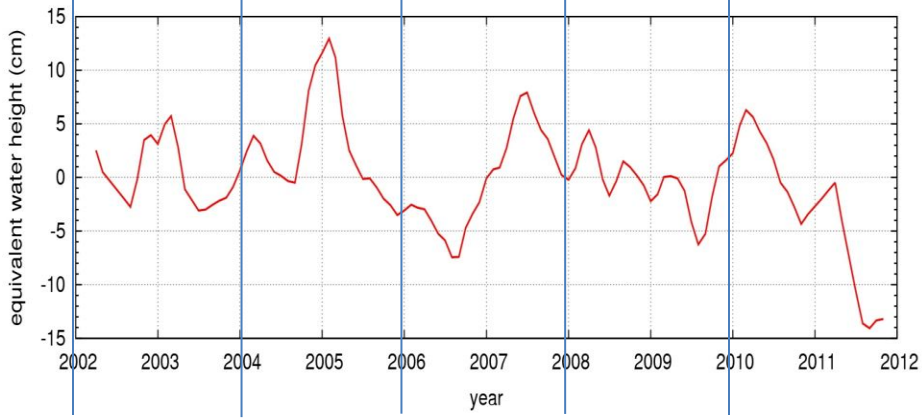


Gravity Anomaly for Texas

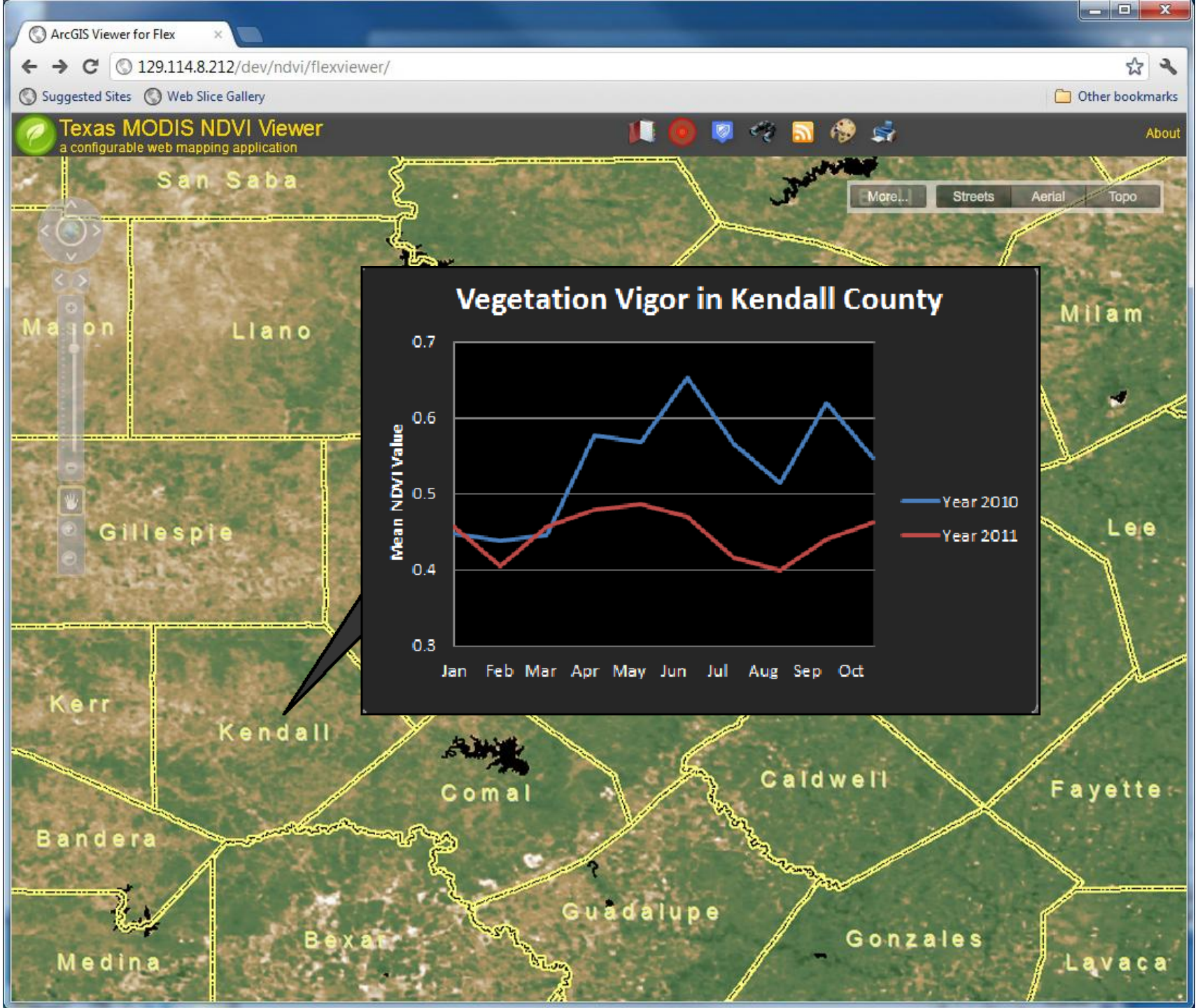
http://www.csr.utexas.edu/grace/

- GRACE Mission measures the force of gravity from space
- Gravity varies with time because of water storage variations
- Possibly use this as a Texas Water Index

Water Level in the Edwards Aquifer

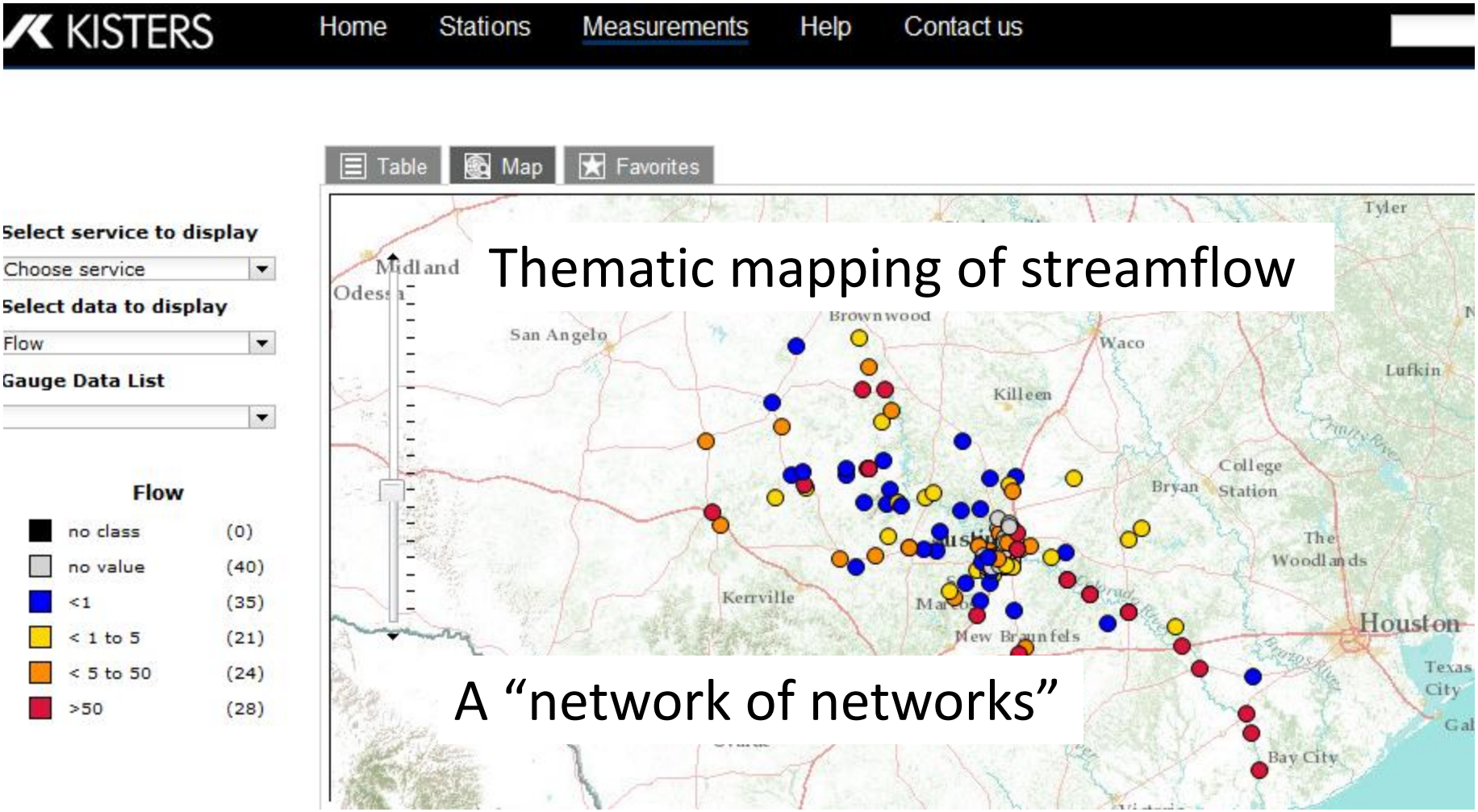


Gravity Anomaly

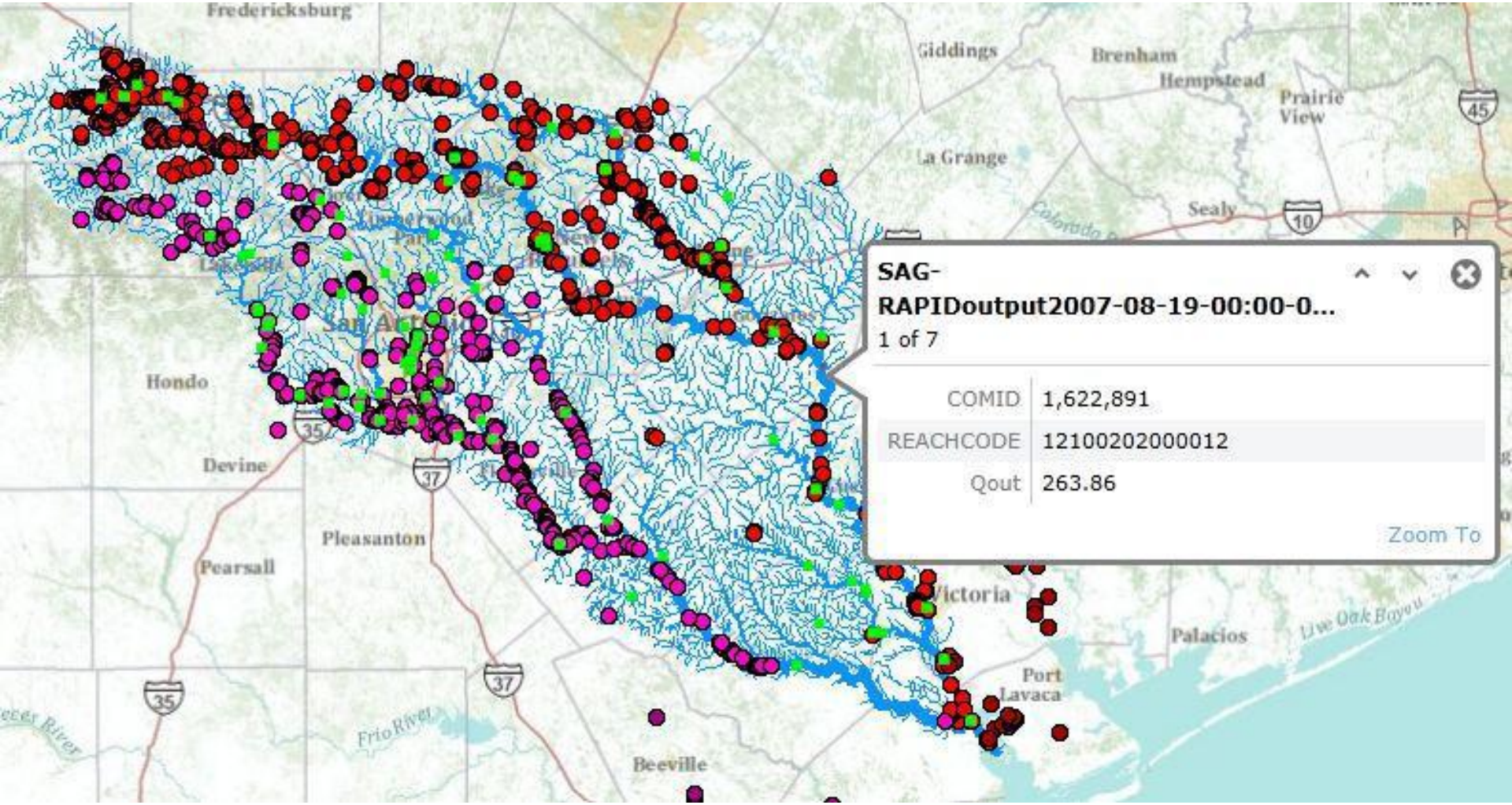

ArcGIS Viewer for Flex
129.114.8.212/dev/ndvi/flexviewer/
Suggested Sites
Web Slice Gallery
Other bookmarks
Texas MODIS NDVI Viewer
a configurable web mapping application
About
More...
Streets
Aerial
Topo
San Saba
Mason
Llano
Milam
Gillespie
Lee
Kerr
Kendall
Comal
Caldwell
Fayette
Bandera
Guadalupe
Bexar
Gonzales
Medina
Lavaca
Vegetation Vigor in Kendall County
Mean NDVI Value
0.7
0.6
0.5
0.4
0.3
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Year 2010
Year 2011

Central Texas Hub

http://www.centraltexashub.org/wiskiweb.htm



Web Map – Published as Map Service



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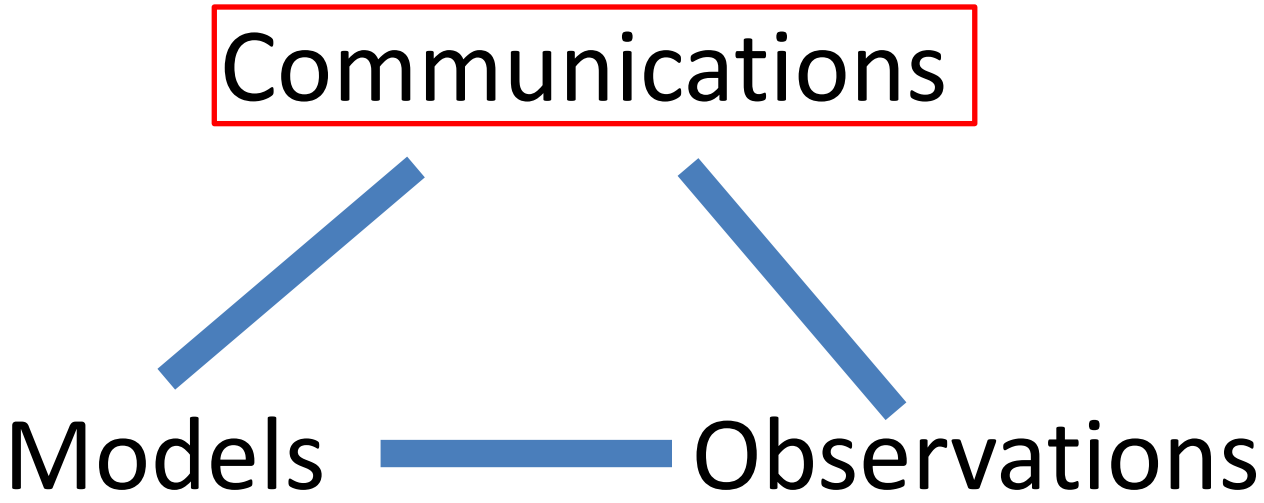
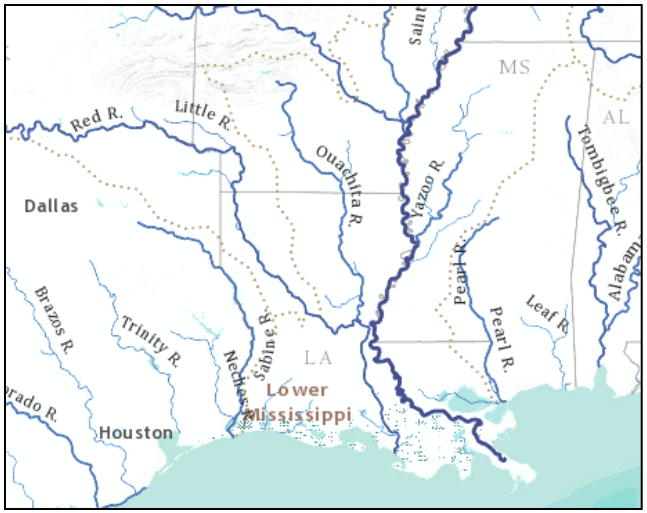
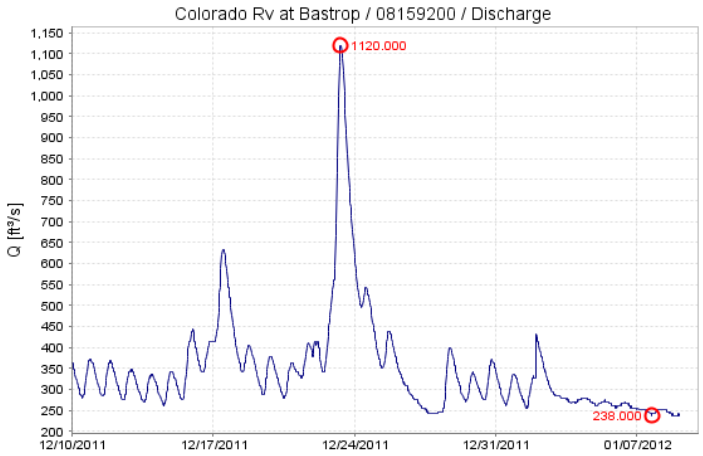


World Water Online

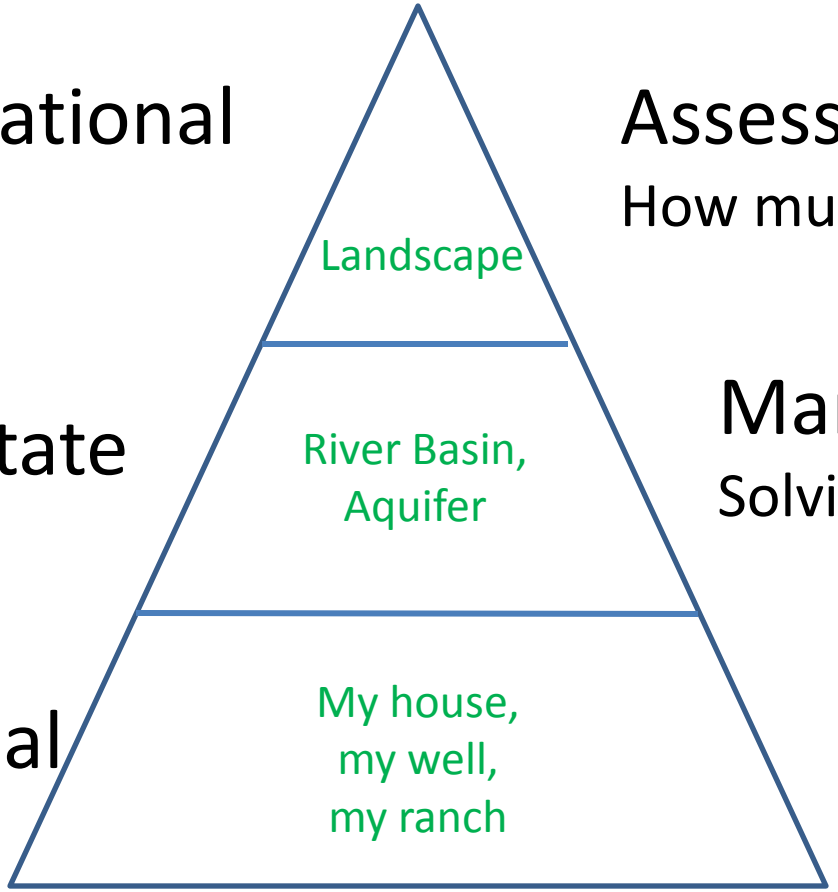
- Bring together water information for the whole earth
- All spatial scales: global, regional, local
- Both geospatial and temporal information
- Linking data and modeling
- Everything on the web





…. a transformation of our world!

Scales of HydroInformatics



Global, National

Assessment

How much water?

Regional, State

Management

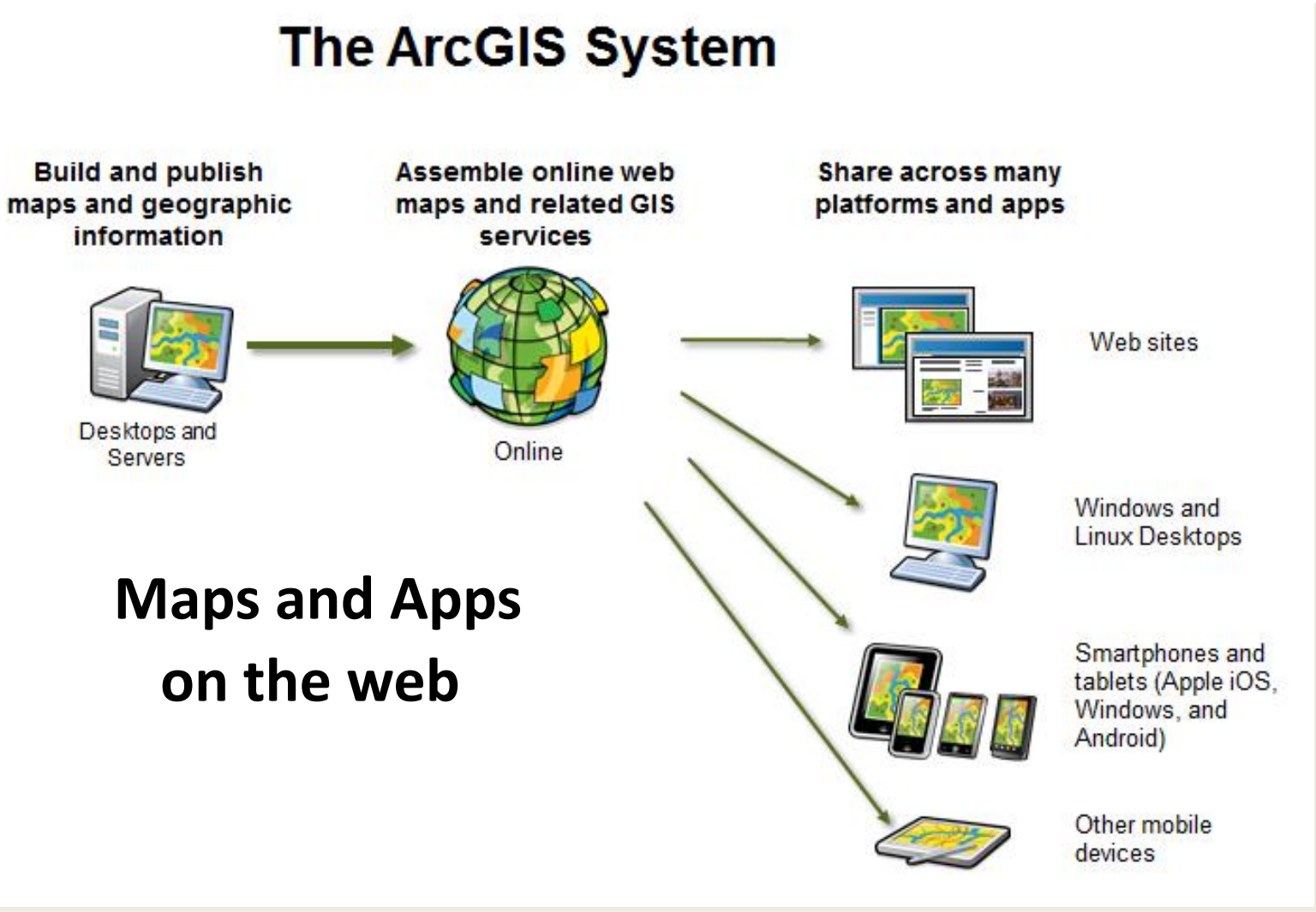
Solving water problems

Local, Personal

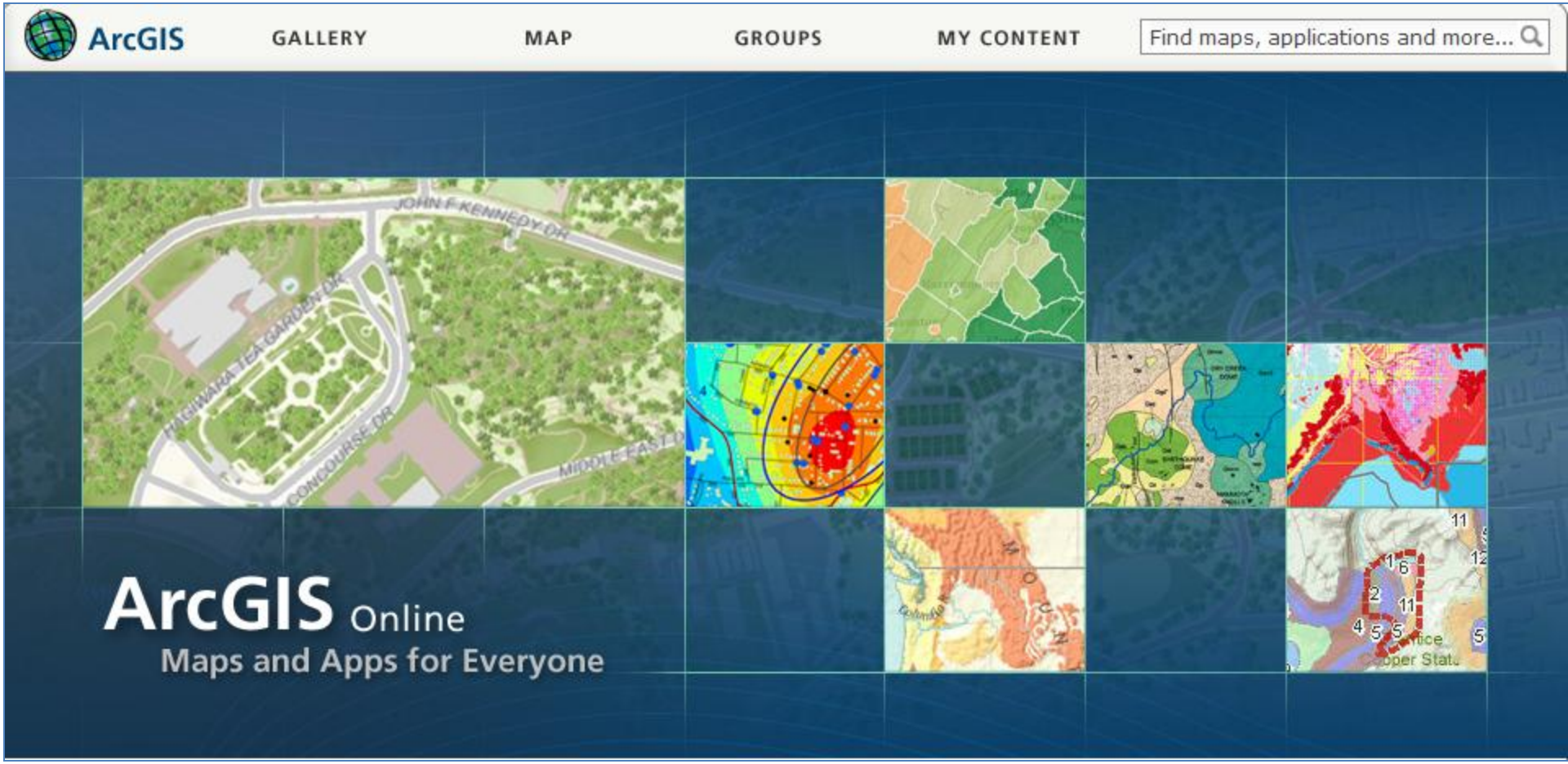
Engineering

How does this affect me?

What ESRI is doing



ArcGIS Online



…. is making map information globally and freely accessible

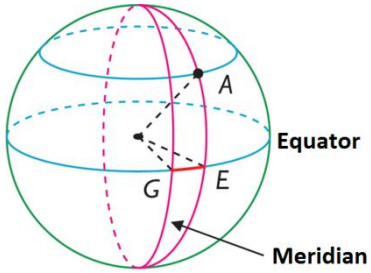
ArcGIS Online

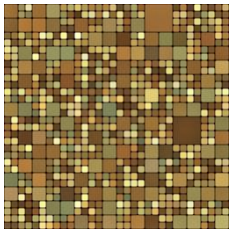
esri

bing

Google

Decimal Degree ⟶ Pixel





Map Scales for Image Tiles

20 Zoom Levels

Zoom Level	Map Scale
0	1:591,657,550.500000
1	1:295,828,775.300000
2	1:147,914,387.600000
3	1:73,957,193.820000
4	1:36,978,596.910000
5	1:18,489,298.450000
6	1:9,244,649.227000
7	1:4,622,324.614000
8	1:2,311,162.307000
9	1:1,155,581.153000
10	1:577,790.576700
11	1:288,895.288400
12	1:144,447.644200
13	1:72,223.822090
14	1:36,111.911040
15	1:18,055.955520
16	1:9,027.977761
17	1:4,513.988880
18	1:2,256.994440
19	1:1,128.497220

→ 1 Pixel = 1.40624 °
~ 4.9km at Equator

→ 1 Pixel = 0.00549 °
~ 612m at Equator

→ 1 Pixel = 0.000003 °
~ 30cm at Equator

Global Topographic Basemap in ArcGIS Online

Information contributed by many cities and countries

World

United States

Texas

Austin

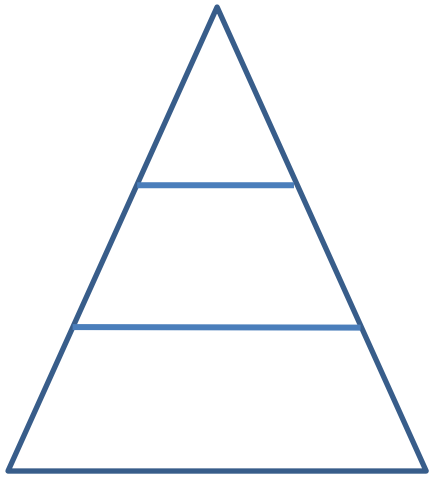
Home

[ArcGIS Online Topo Map]

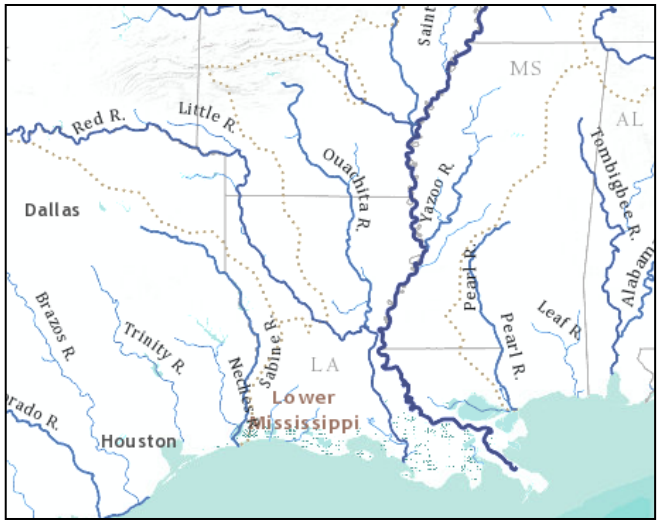
Tiled base map synthesizing information across map scales

A Connected System Over all Spatial Scales

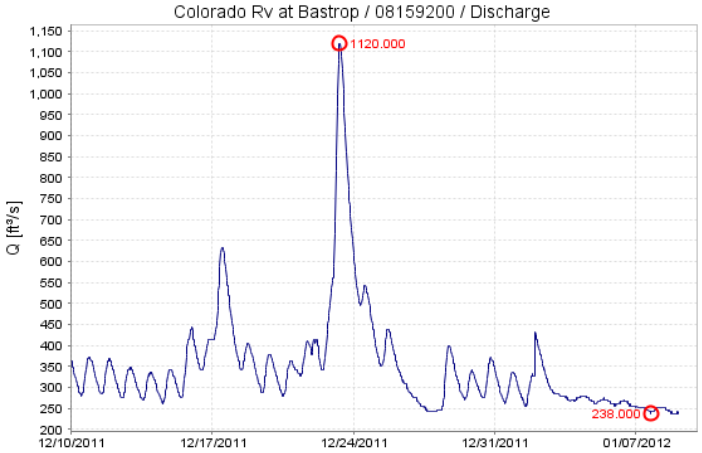
Watershed Analysis



River Mapping



Observations



Water Web Services HUB

Inputs

USGS science for a changing world

LCRA ENERGY • WATER • COMMUNITY SERVICES

CITY OF AUSTIN FOUNDED 1839

NATIONAL WEATHER SERVICE

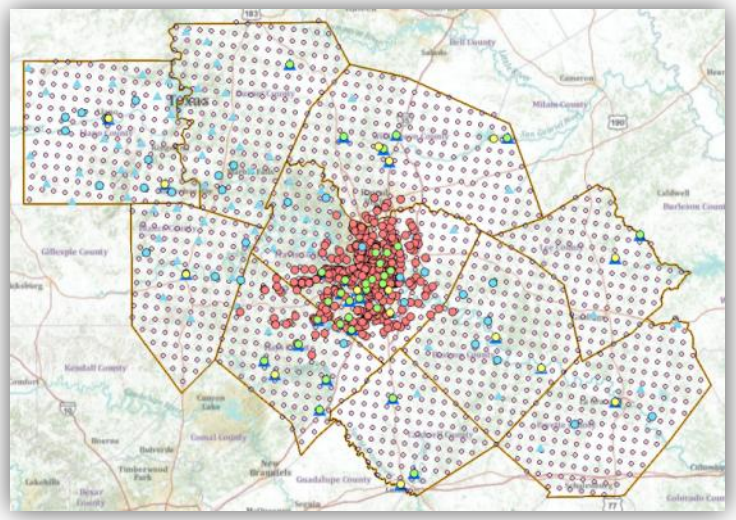
esri

Water Web Services HUB

Observation Data Services (WaterML)

H&H Data Services

- USGS
- LCRA
- COA
- NWS
- AHPS



Observation Data Services (WaterML)

Mapping Services

Outputs

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Data Services

Modeling Services

Mapping Services

IBM

Models

Maps

Summary

- Today has been an exciting experience for me. I've learned a lot about the complexity of the problems we face and the talents we have to bring to solve them
- We need to work together to solve these problems using the facilities of the University as a shared resource