NOAA-NASA GOES-R Program and GMU CSISS Joint Efforts for Supporting GEOSS AIP-3 Drought Scenario

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Outline of Contributions

- **SBA scenario development and demonstration**
  - **Water – drought & extreme precipitation**
- **Goal**
  - **Infuse and reuse NOAA/NASA data and products into the SBA**
  - **Develop drought products using service chaining**
- **Standard-based services to support the SBA scenario**
  - **Data services**
  - **Geospatial processing Web services**
  - **Workflow engine service (BPELPower)**
  - **Geospatial processing portal service (GeOnAs)**

SBA scenario development and demonstration

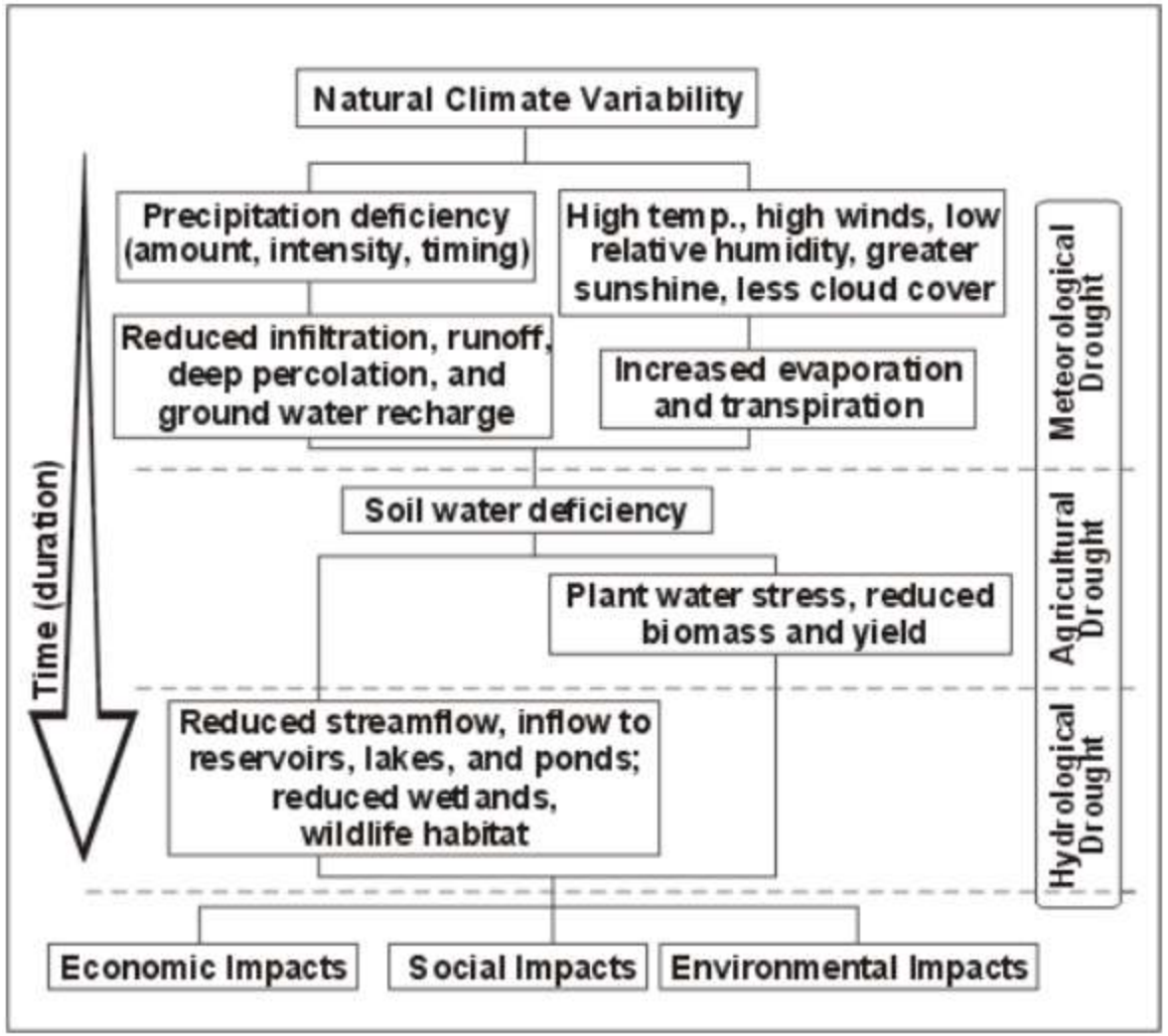
- Water - Drought Scenario
  - Soil moisture and precipitation are an important indicators of drought
  - GOES Precipitation product (North and South America), NASA EOS AMSR-E Soil moisture (25 km), CSISS downscaling high resolution soil moisture (1 KM).
    - WCS service available for those products
  - Infusion of those products into water- drought scenario

Drought Definition

- Conceptual definitions
  - formulated in general terms, help people understand the concept of drought, e.g., a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield.
- Operational definitions
  - help people identify the beginning, end, and degree of severity of a drought.
  - Many definitions (>150); No single definition works for all circumstances.
- Categorized operational definitions
  - Wilhite and Glantz (1984)
  - Based of four basic approaches to measuring drought
  - Meteorological, hydrological, agricultural, and socioeconomic

From http://www.drought.unl.edu/whatis/define.htm

Sequence of Drought Impacts



From http://www.drought.unl.edu/whatis/concept.htm

Drought Indices

- Many indices are used, for example
  - Palmer Drought Severity Index (PDSI)
  - Crop Moisture Index (CMI)
  - Moisture Availability Index (MAI)
  - Index of Moisture Adequacy (IMA)
  - Standardized Precipitation Index (SPI)
  - Effective Drought Index (EDI)
  - Surface Water Supply Index (SWSI)
  - Percentage of Normal
- GMU/CSISS to produce two high resolution soil moisture parameters
  - Root zone soil moisture
  - Surface soil moisture
  - Can also be input to drought indices

Deal with Drought Event

- Pre-event
  - Vulnerable/risk area
  - Prevention and Mitigation Plans
  - Potential risk/impact estimation
  - Prediction
  - Monitoring
- During-event
  - Real-time monitoring
  - Mitigation
  - Relief
- After-event
  - Impact assessment

Actors

- Data producers
  - Any person/organization producing index/indices.
  - GMU/CSISS publishes soil moisture and drought indices
  - GMU/CSISS to use Geospatial Web Service technologies.
- Data users
  - Wide range of communities: scientists, policy makers, resources planners, farmer, general public, …

Scenario (1/2)

- Event trigger: drought or potential drought
- User needs: drought information
- Discovery: from service/data registry
- Request: user sends a request
- On-demand production
  - the request is accepted and the production begins with the automatic workflow (get source data from sensor observation services, e.g., NASA aqua data, start work flow, done index generation, respond to the user)

Scenario (2/2)

- Actions: user uses the results to take actions (e.g., change in irrigation planning/management/practice);
- Event condition changes (drought relieved/progressed), user needs more info/prediction and sends more requests
- Interaction continues

Drought index development

- To be representative
  - Combining both surface soil moisture
  - And root zone soil moisture
- Soil moisture to be generated
  - Surface soil moisture: downscaling
  - Root zone soil moisture: Based on energy balance theory (Di, 1991)

Implementation as WPS processes

- Downscaling soil moisture
- Root zone soil moisture

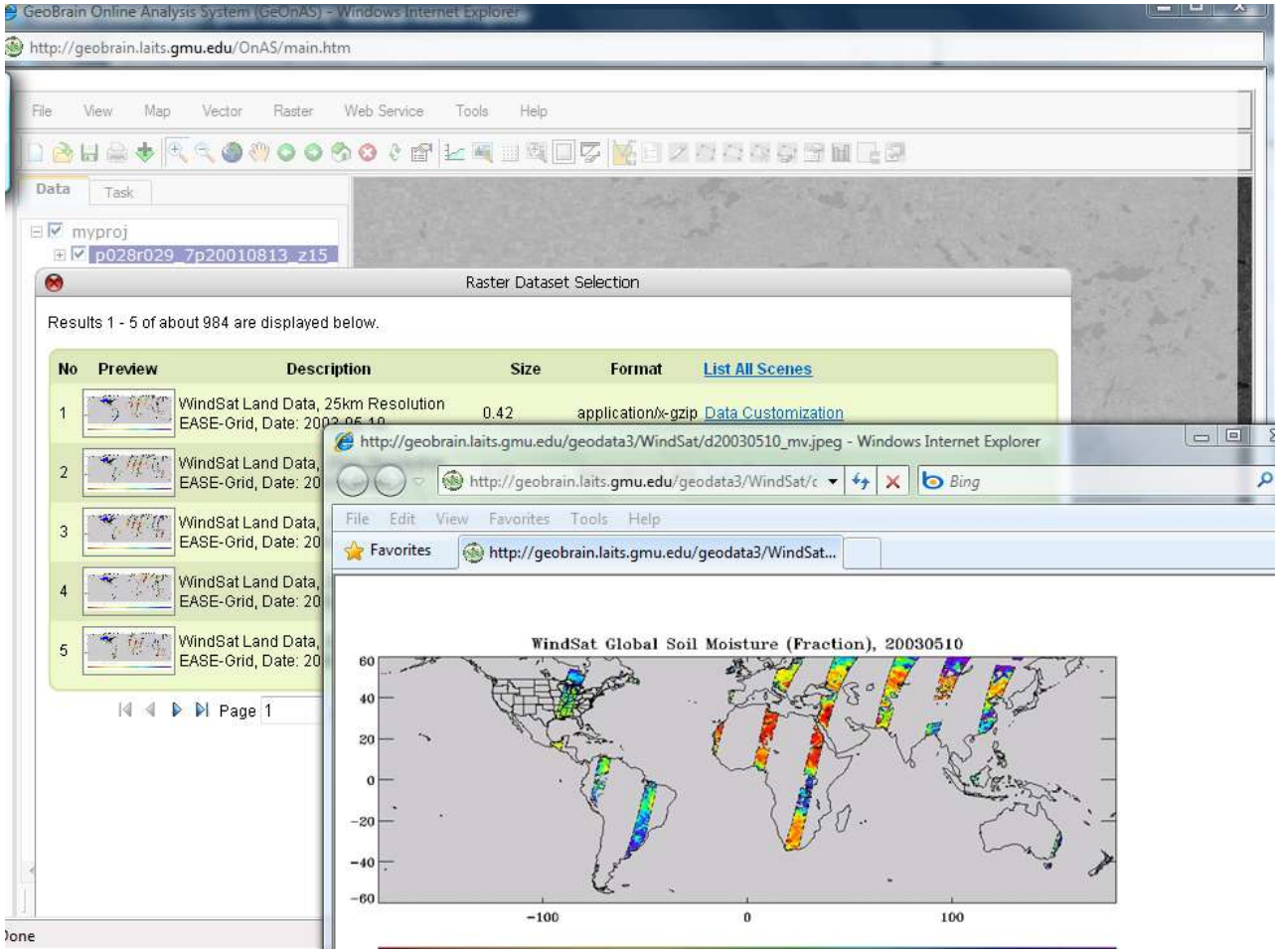
Workflow

- AMSR-E soil moisture + MODIS data => downscaled soil moisture

Persistent data storage service

- Data services
  - WCS
- Presentation
  - WMS

GeoBrain Online Analysis System



Geospatial Data Products Download