FLOODVIZ

VISUAL ANALYTICS FOR ASSESSMENT AND INTERPRETATION OF SIMULATED RIVER FLOODING

NGI Annual Meeting

May 2011

NGI Northern Gulf Institute

GRI

National Weather Service

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

FloodViz Team

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  - Song Zhang
  - Derek Irby
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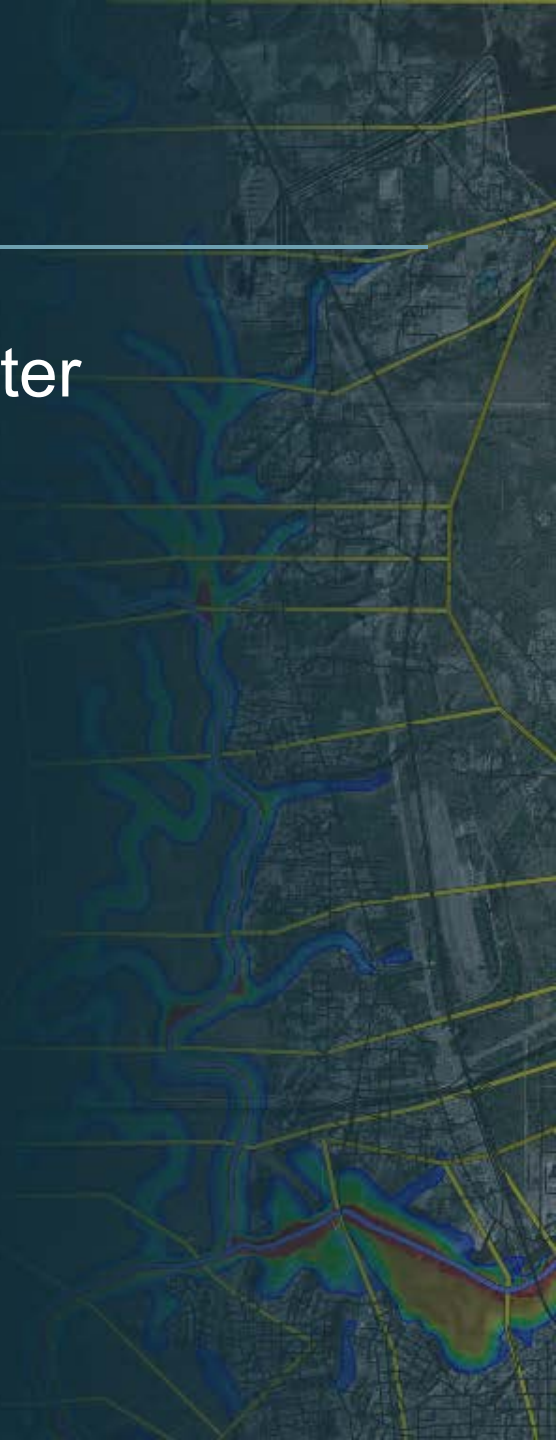
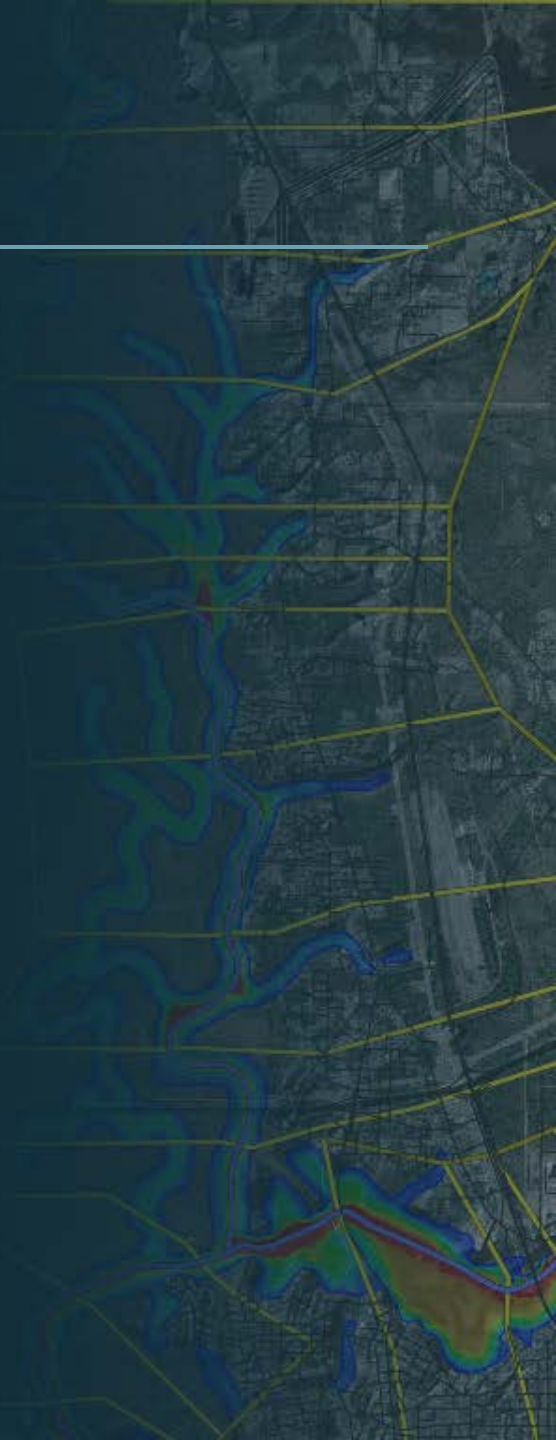


Outline

- LMRFC Overview
- River Forecast
- Visualization Needs
- FloodViz
  - Concepts
  - Plans
  - Schedule
- Summary

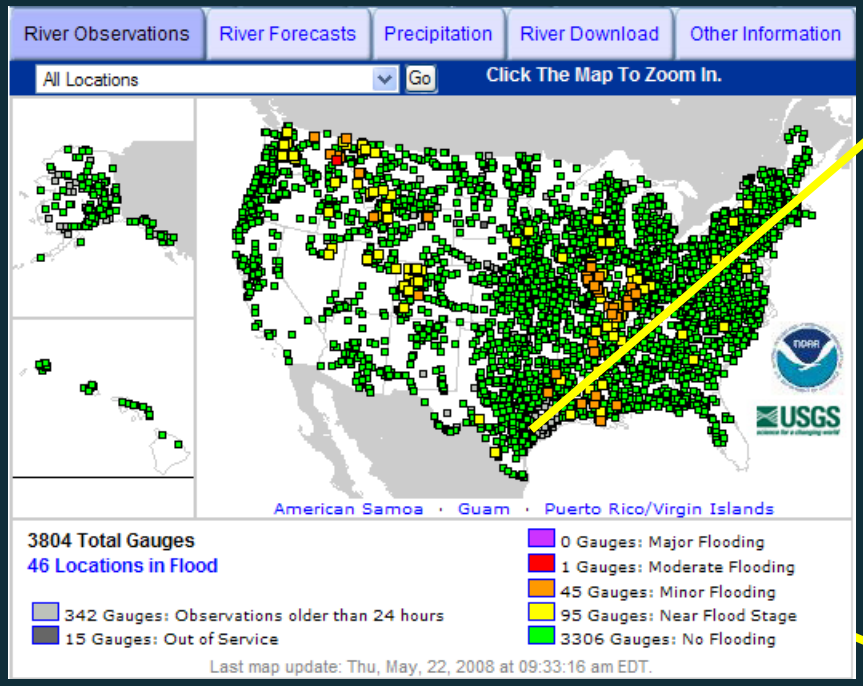


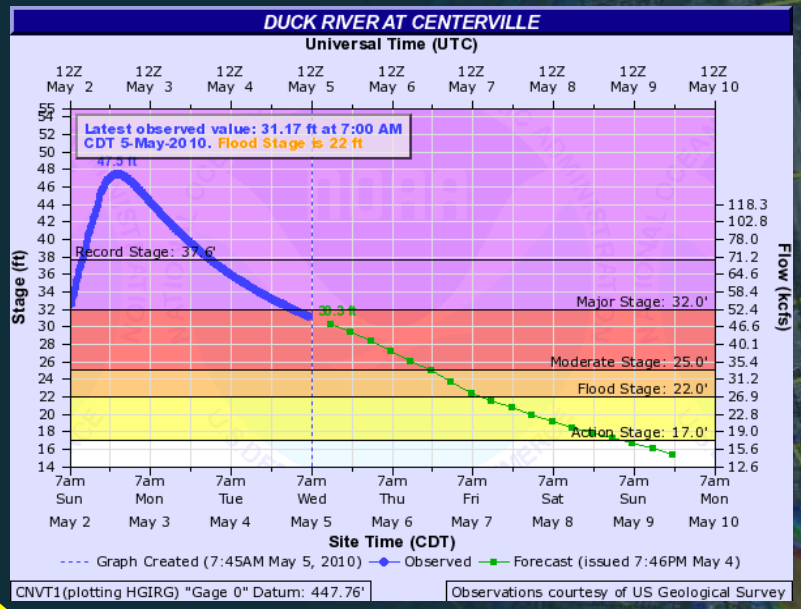
Lower Mississippi River Forecast Center

- One of 13 River Forecast Offices
  - Run hydrologic and hydraulic simulations of water runoff and stream routing to provide river forecast to the public.
- Daily Operations
  - Data collection and quality control
  - Precipitation and Hydrologic Forecasts
- Spectrum of Flood Hazards
  - Tropical systems
  - Snowmelt
  - Ice jams
  - Dam/Levee failures
  - Flash Floods

River Forecasts

- Model Simulations performed at each sub-basin (500+ sub-basins in Lower Mississippi RFC area)
- Deterministic forecasts issued at 232 points

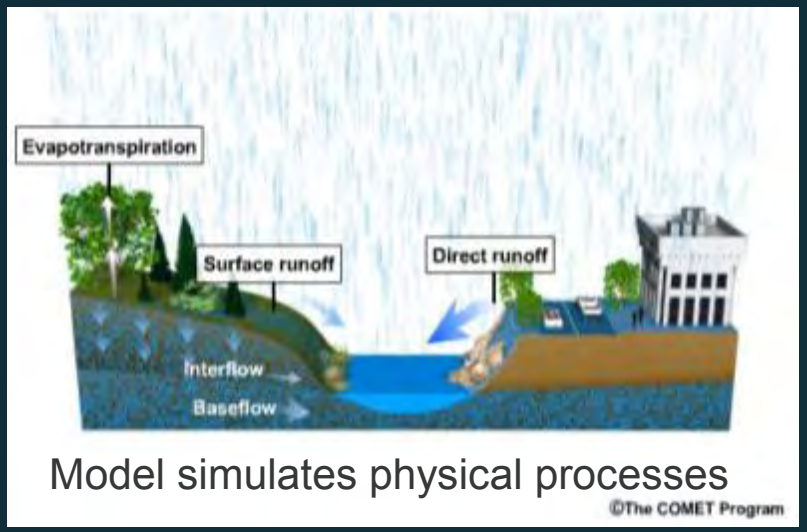




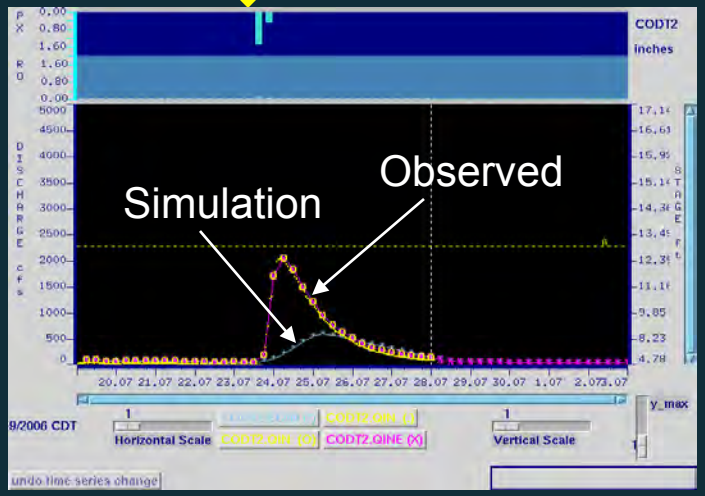
http://www.srh.noaa.gov/lmrfc/

River Forecasts

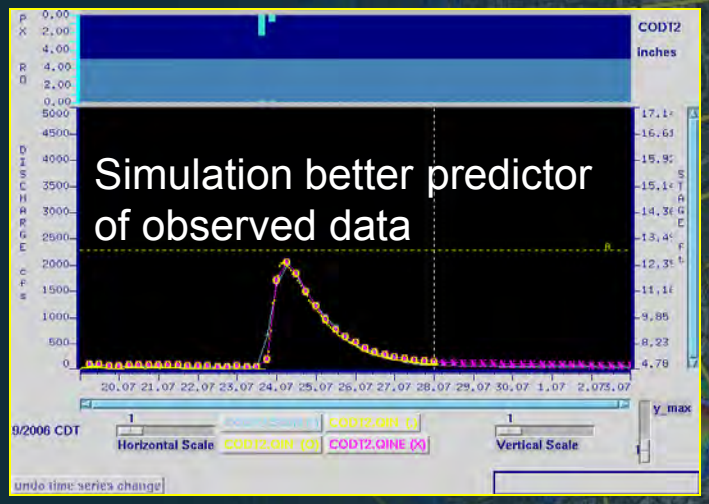
- Conceptual models used to simulate physical processes on soil column
- Extensive initial calibration of model parameters
- Forecasters use interactive program to adjust model parameters in real time
- Lack real-time visualization tools for flood mapping



Model simulates physical processes

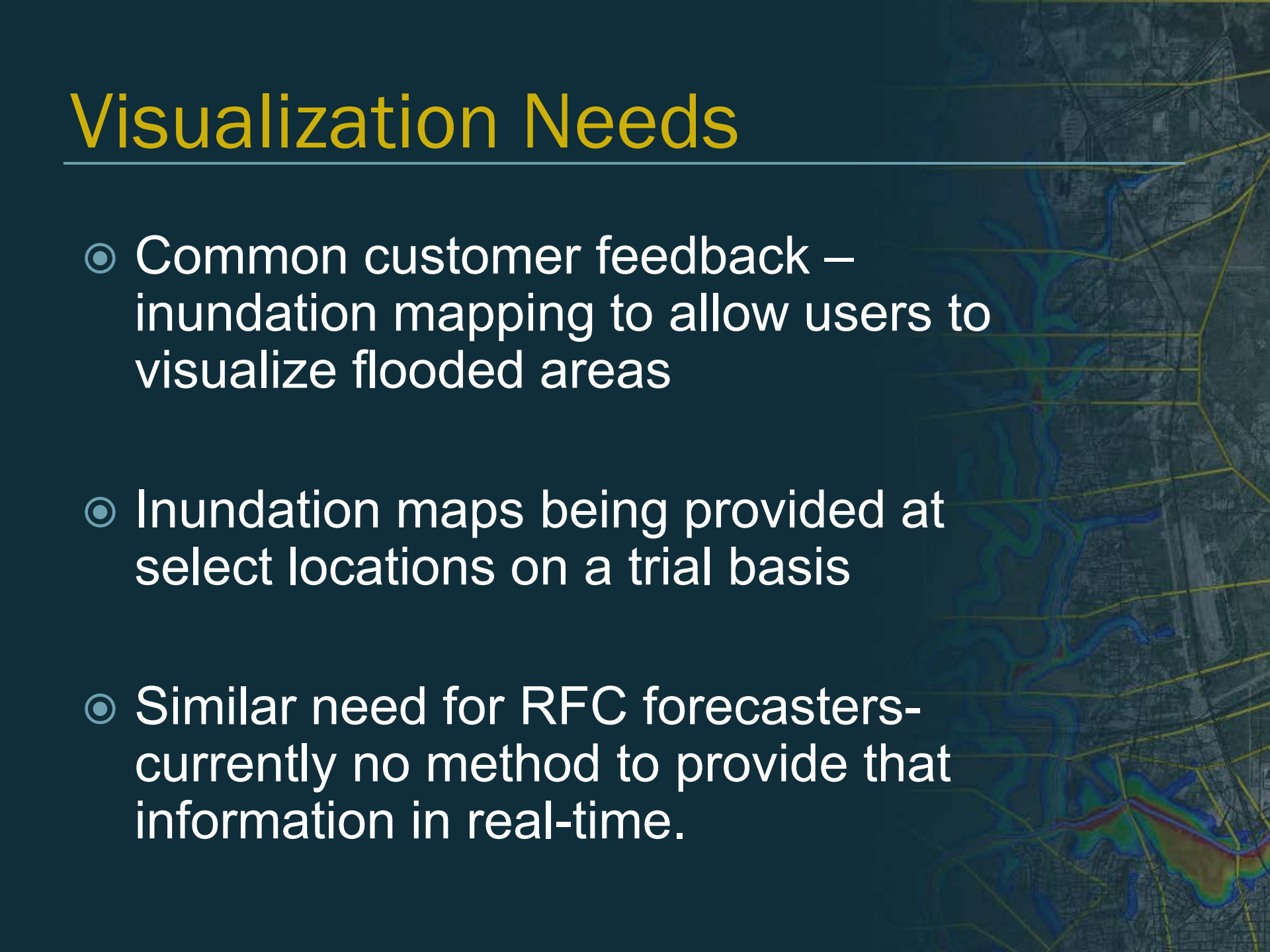


Forecasters adjust model parameters in real time



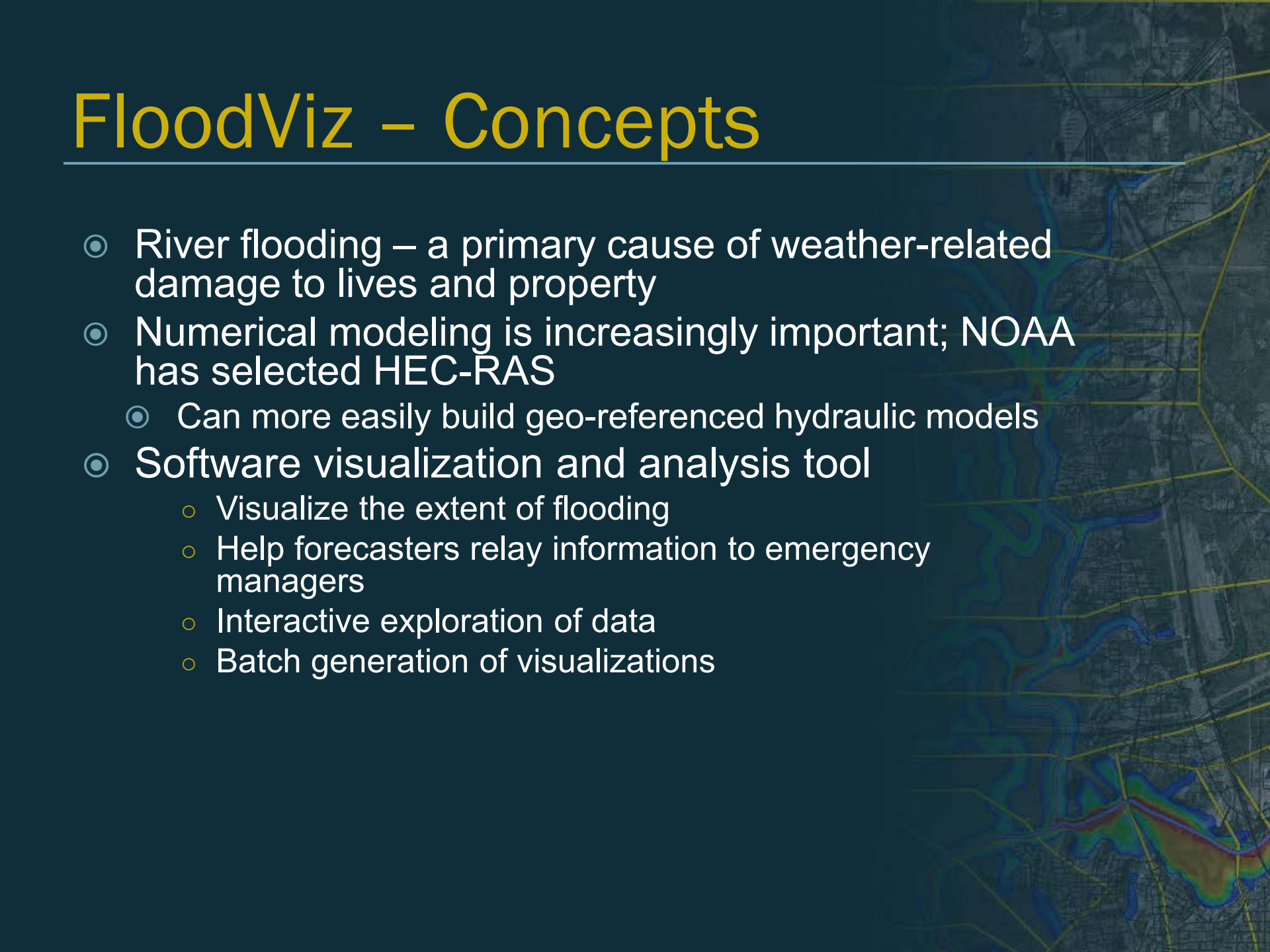
Visualization Needs

- Common customer feedback – inundation mapping to allow users to visualize flooded areas
- Inundation maps being provided at select locations on a trial basis
- Similar need for RFC forecasters- currently no method to provide that information in real-time.



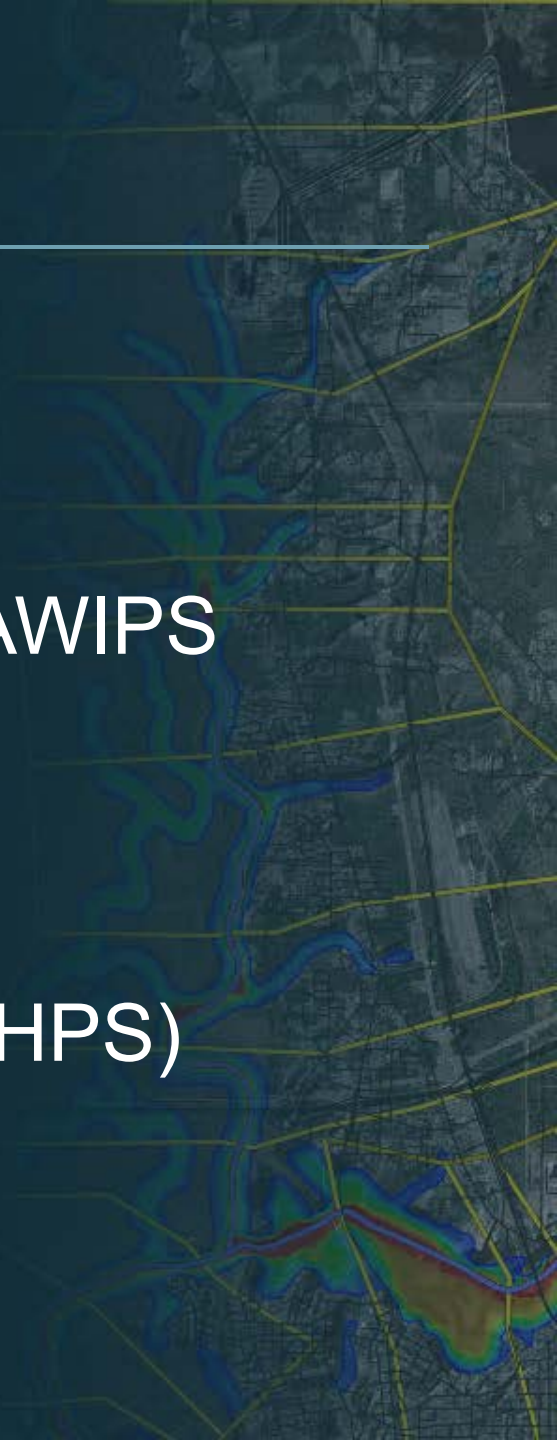
FloodViz – Concepts

- River flooding – a primary cause of weather-related damage to lives and property
- Numerical modeling is increasingly important; NOAA has selected HEC-RAS
  - Can more easily build geo-referenced hydraulic models
- Software visualization and analysis tool
  - Visualize the extent of flooding
  - Help forecasters relay information to emergency managers
  - Interactive exploration of data
  - Batch generation of visualizations



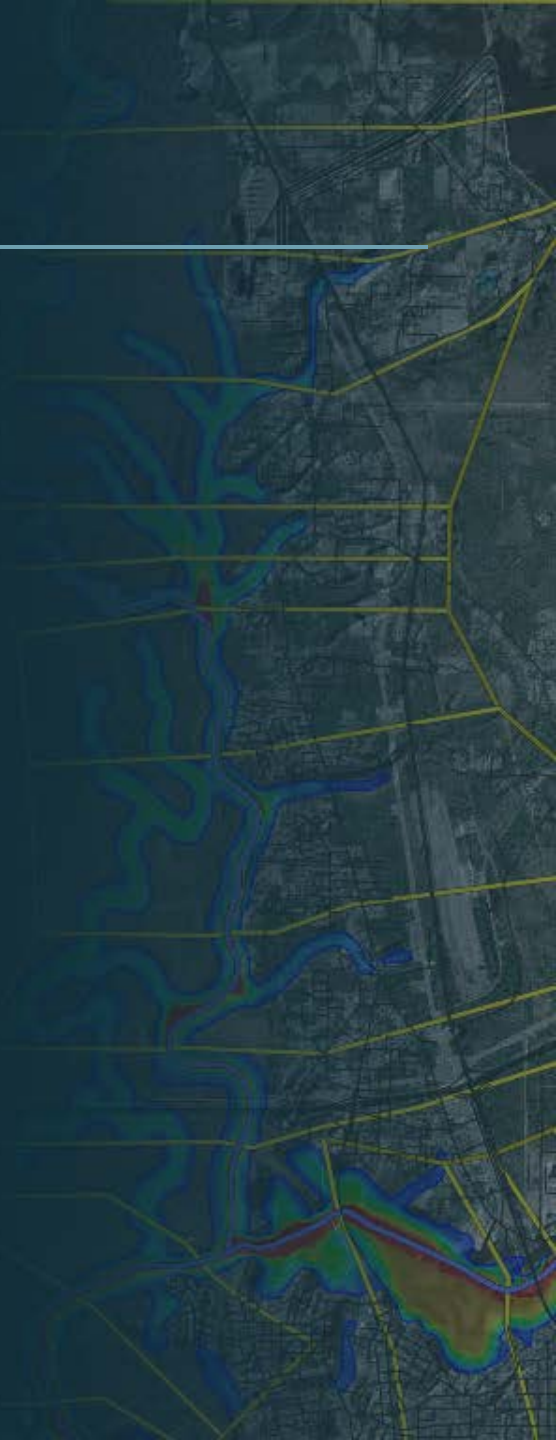
FloodViz - Plans

- Create inundation maps
- Analysis tools
- Compatible with NWS plans for AWIPS hardware and software
  - Linux-based environment
- Integrate with NWS Community Hydrologic Prediction System (CHPS)



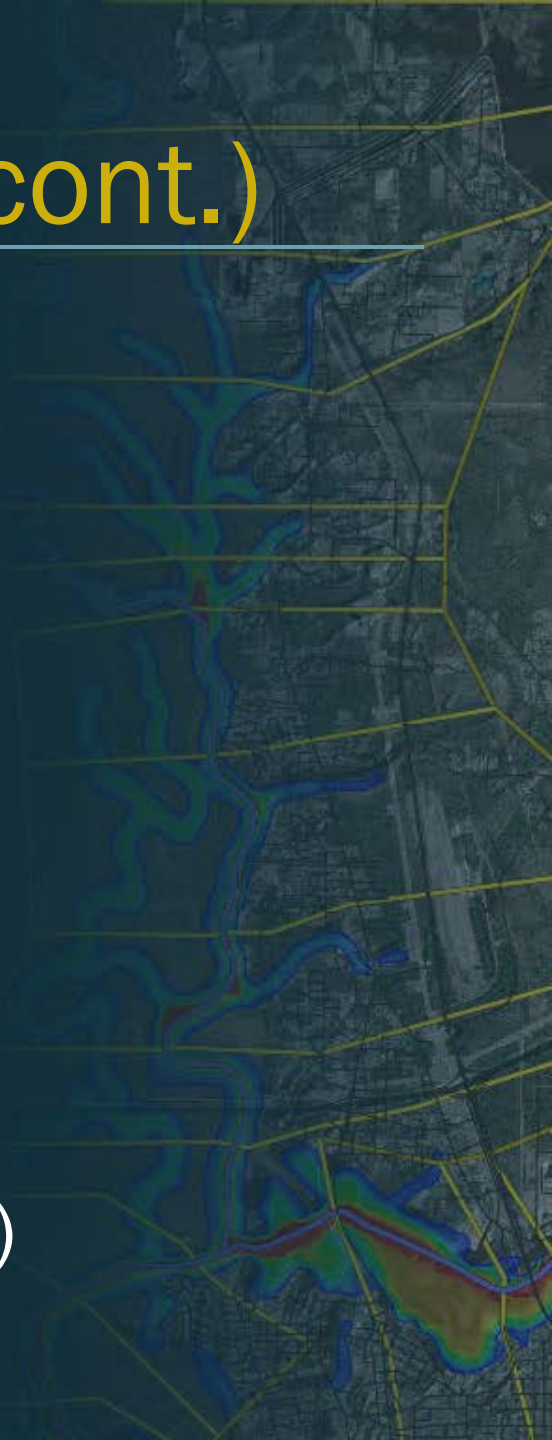
FloodViz – Capabilities

- Open-source foundation
  - OpenGL
  - Qt
  - Boost
  - GDAL/OGR
  - Proj.4
- Cross-platform
  - Linux
  - Mac OS
  - Microsoft Windows

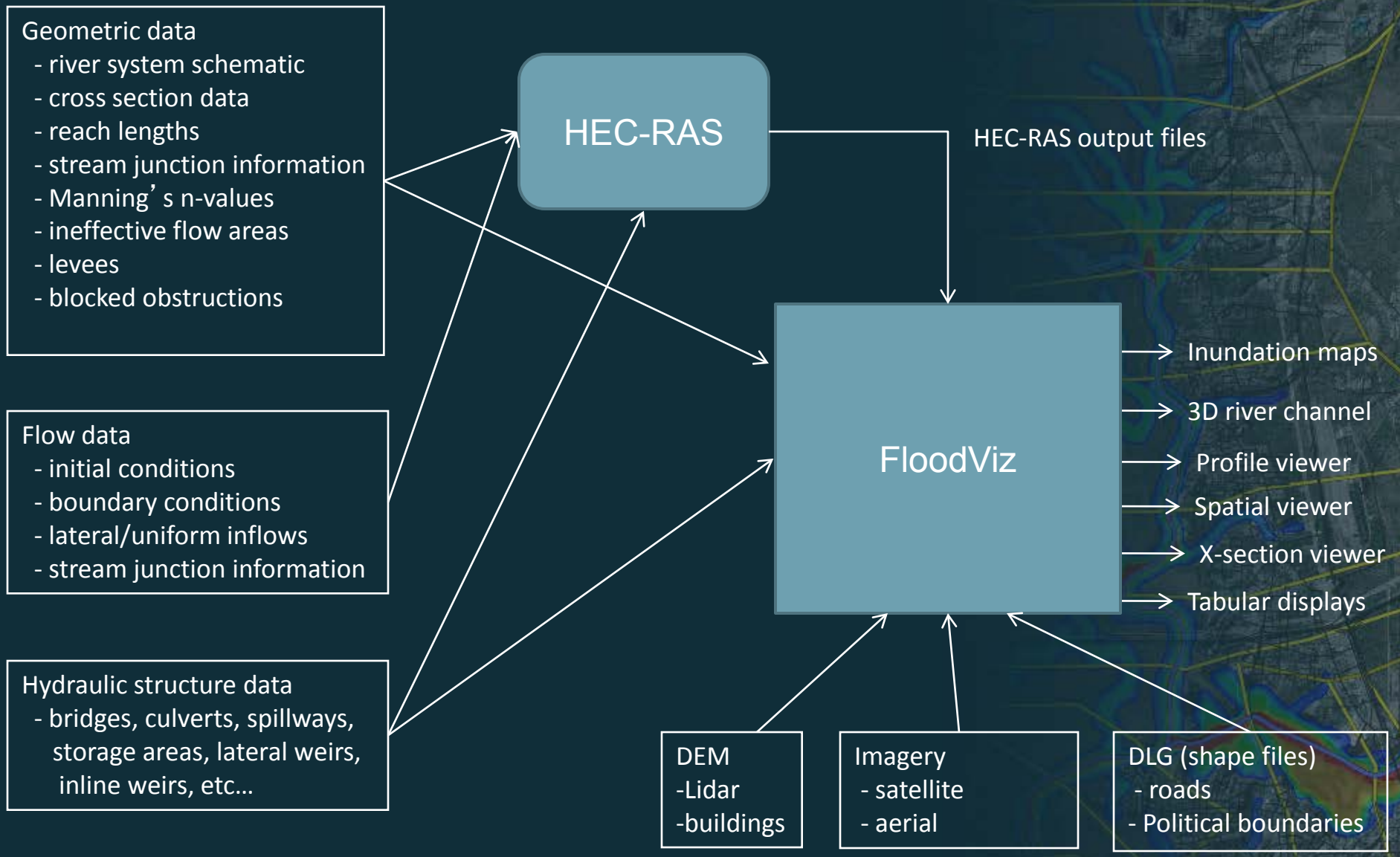


FloodViz – Capabilities (cont.)

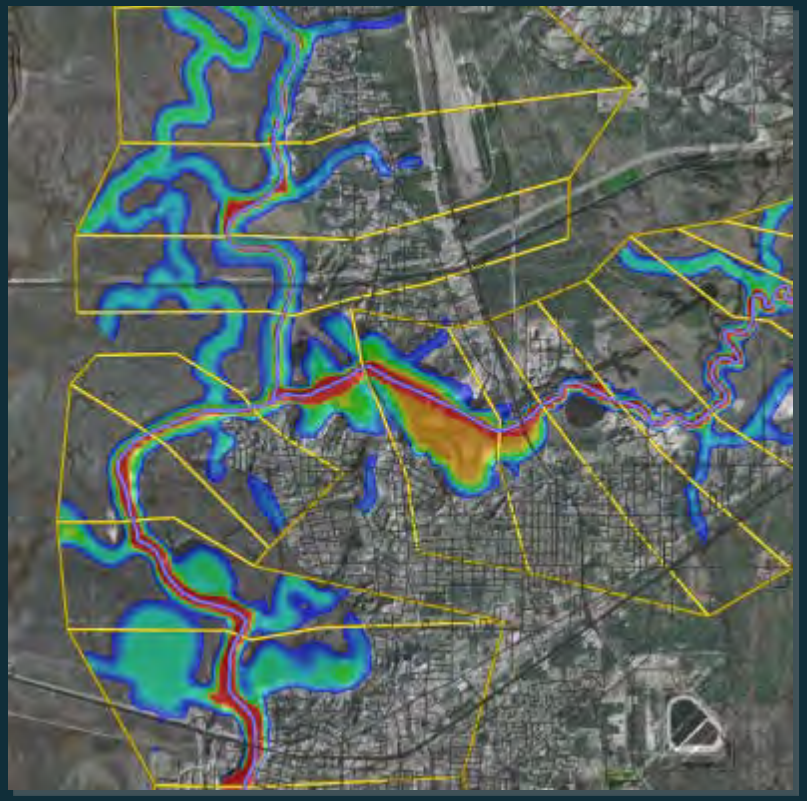
- Multiple ways to view data
  - Plan view
  - 3D view
  - Cross section view
  - Profile view
- Supports multiple data types
  - HEC-RAS output
  - Digital elevation models (DEM)
  - Geo-referenced imagery
  - Shape files (roads, boundaries, etc.)

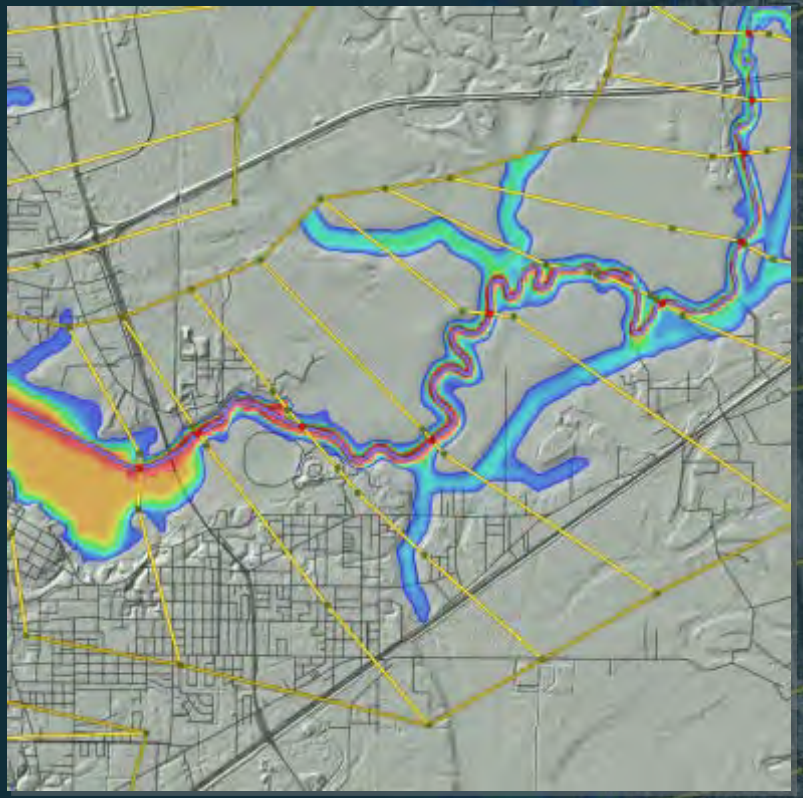


FloodViz high-level block diagram



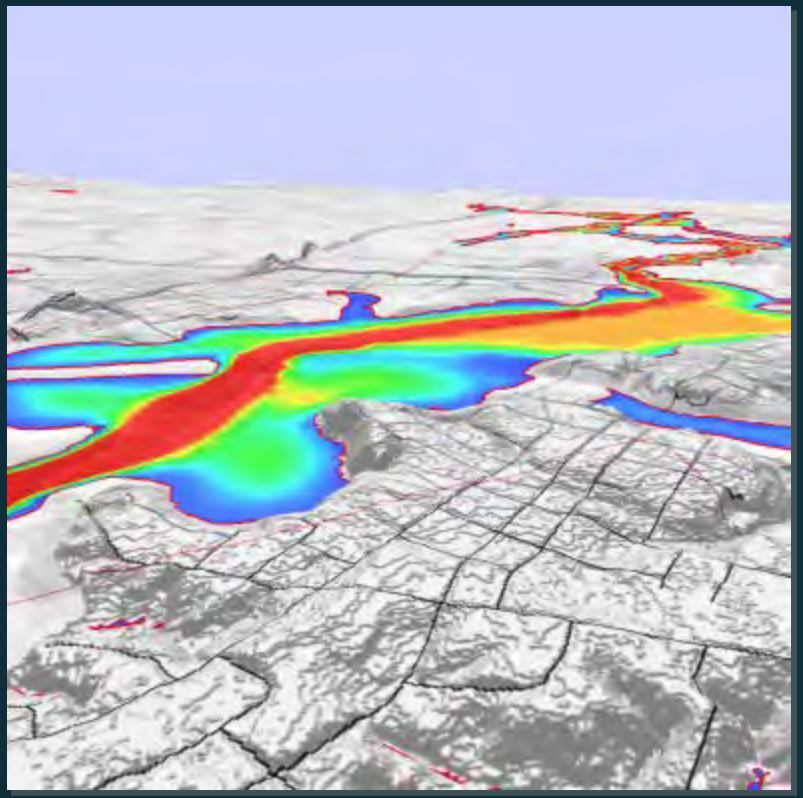
Screenshots



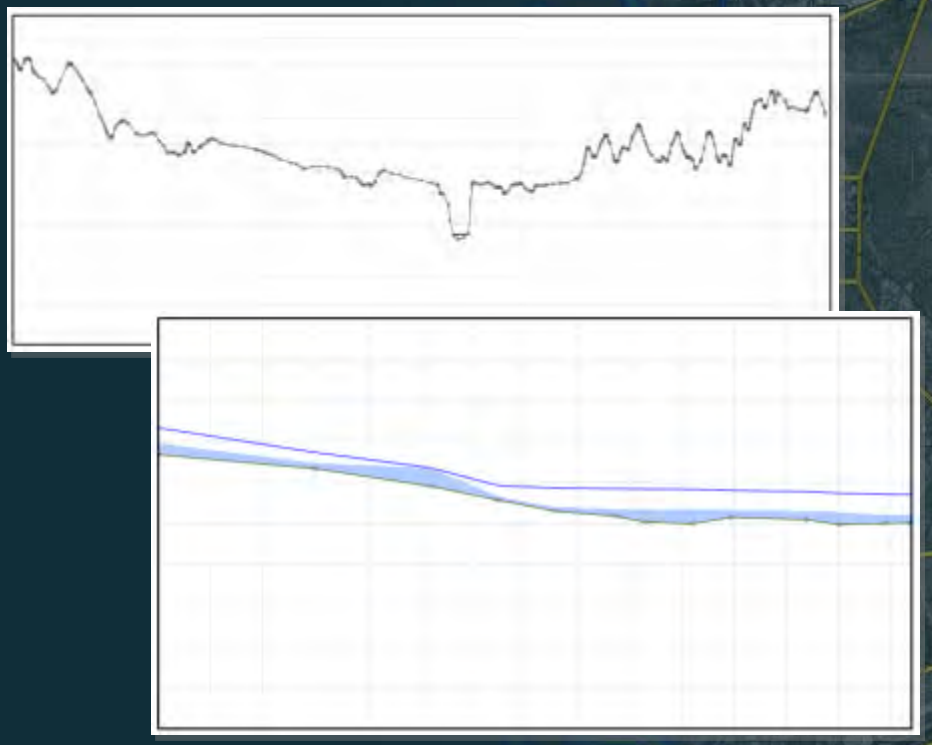


Plan View

Screenshots (cont.)

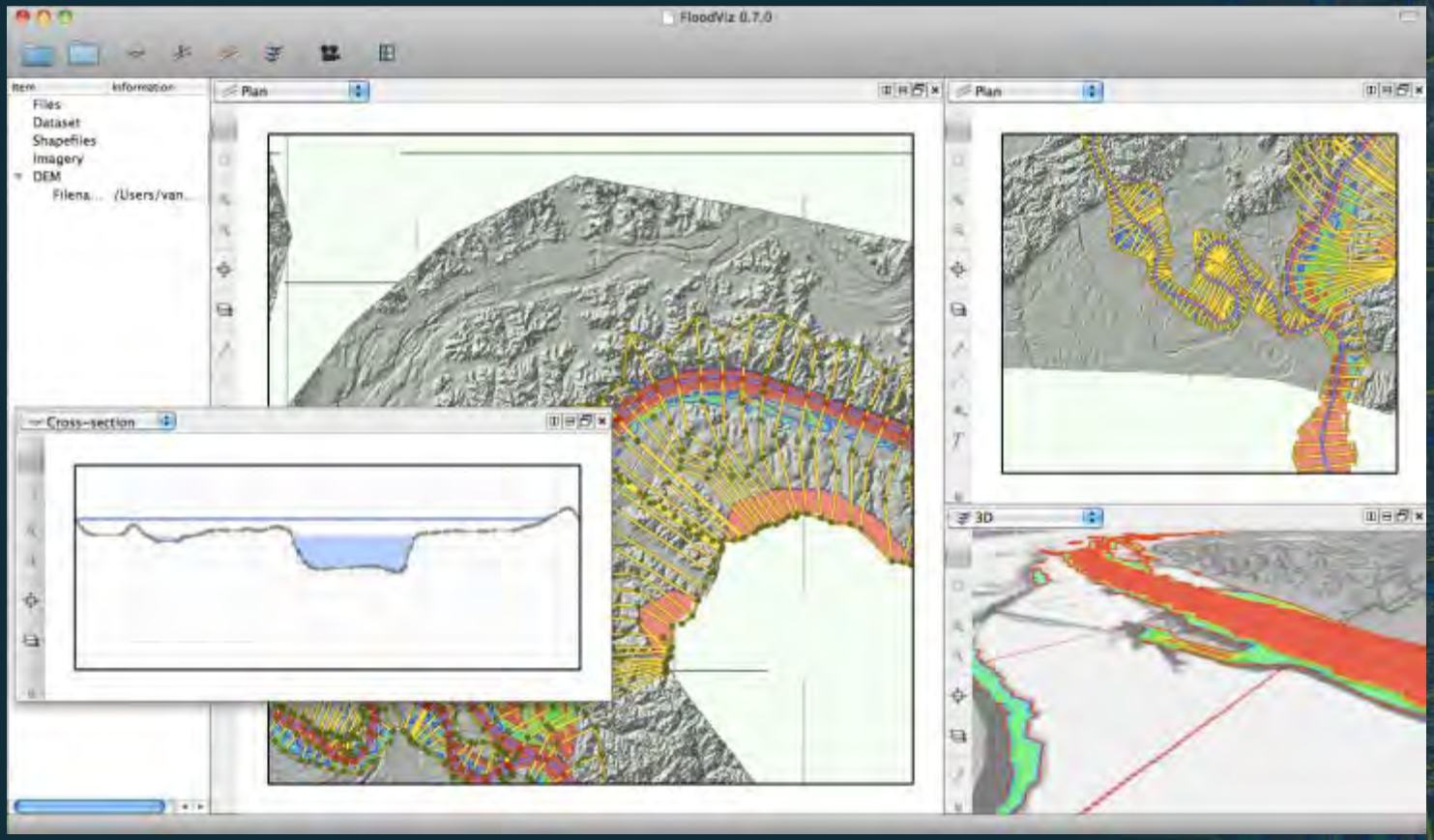


3D View



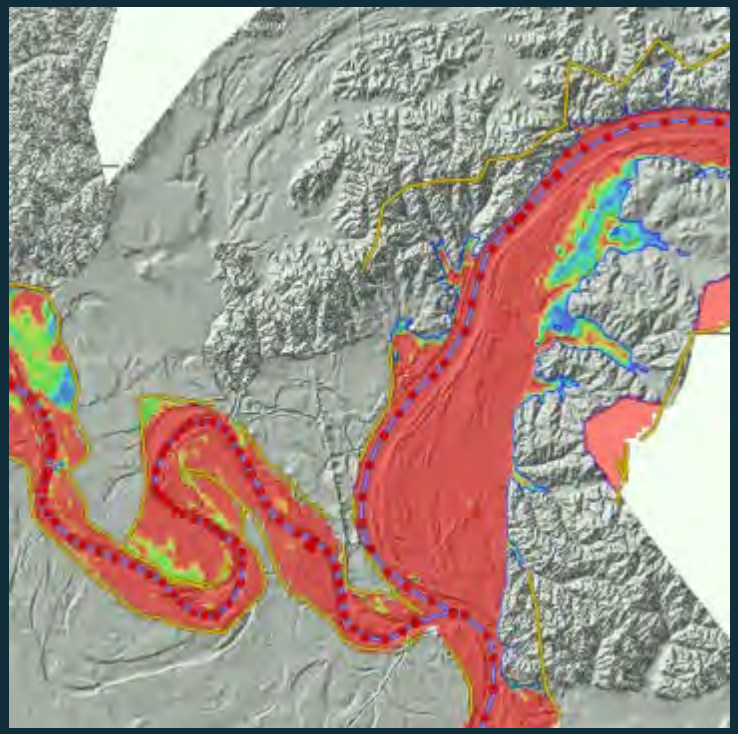
Cross Section and Profile Views

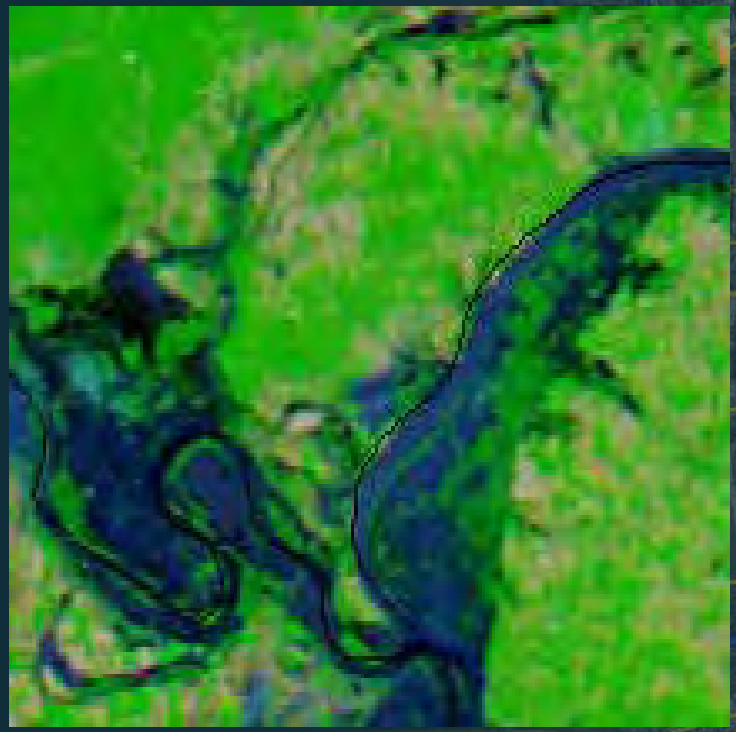
Screenshots (cont.)



Multiple views of data

Screenshots (cont.)

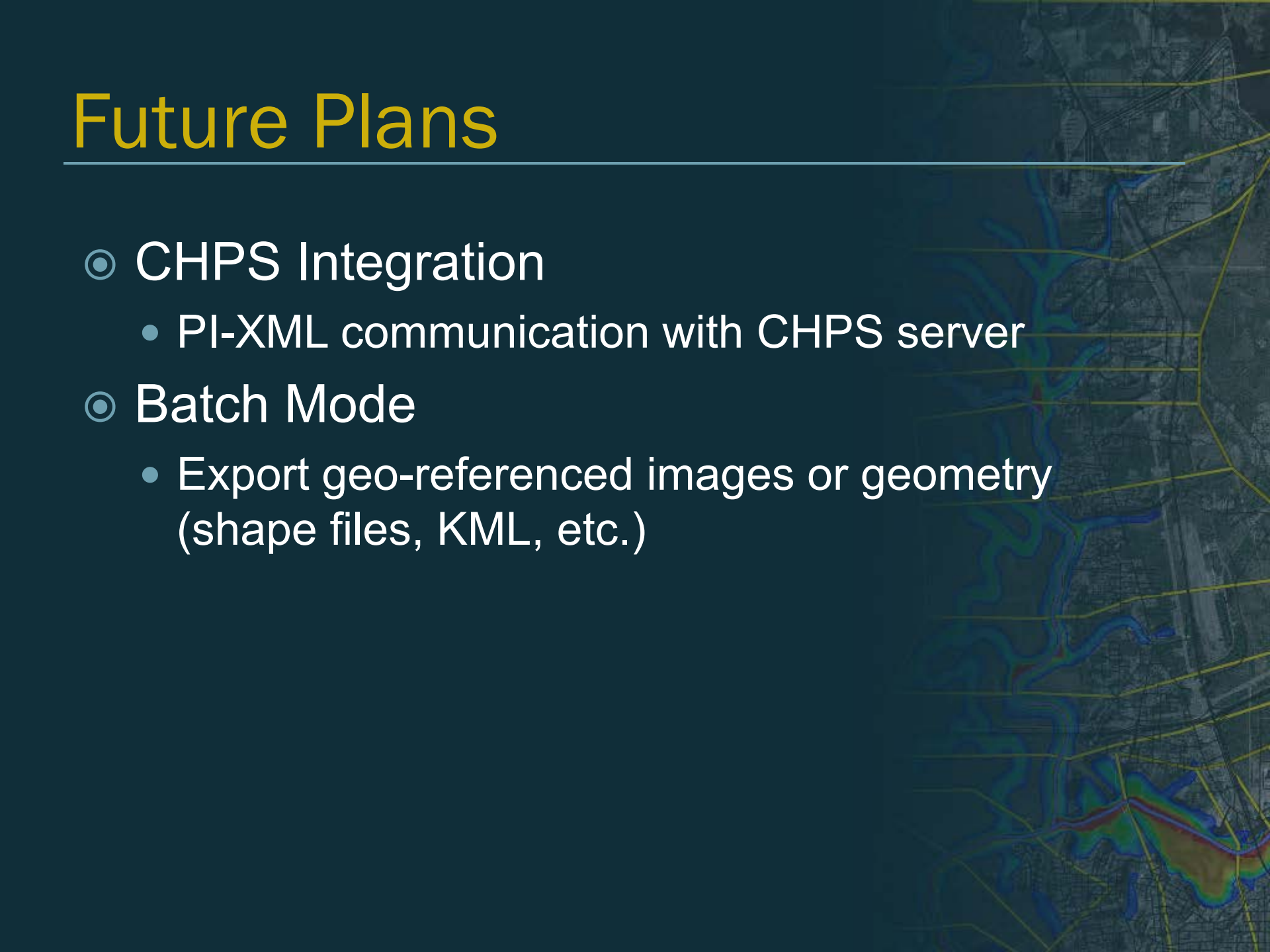




Visualization of HEC-RAS output vs MODIS image
May 6, 2011

Future Plans

- CHPS Integration
  - PI-XML communication with CHPS server
- Batch Mode
  - Export geo-referenced images or geometry (shape files, KML, etc.)



Summary

- Joint effort between LMRFC and MSU
  - Interaction between expert users and developers is critical
- Driving Problem
  - Enable forecasters and scientists to better interpret and distribute hydrologic information
  - Enhance communication to emergency responders and general public
- CHPS and AWIPS compatible
  - Integration into operational work flow at RFC

Poster Session

- Poster and Demo
  - Poster 54
  - Today, 4-6 pm
  - Bon Secour Bay 1 and 2