A new high-resolution flood modeling framework using SWAT and LISFLOOD-FP

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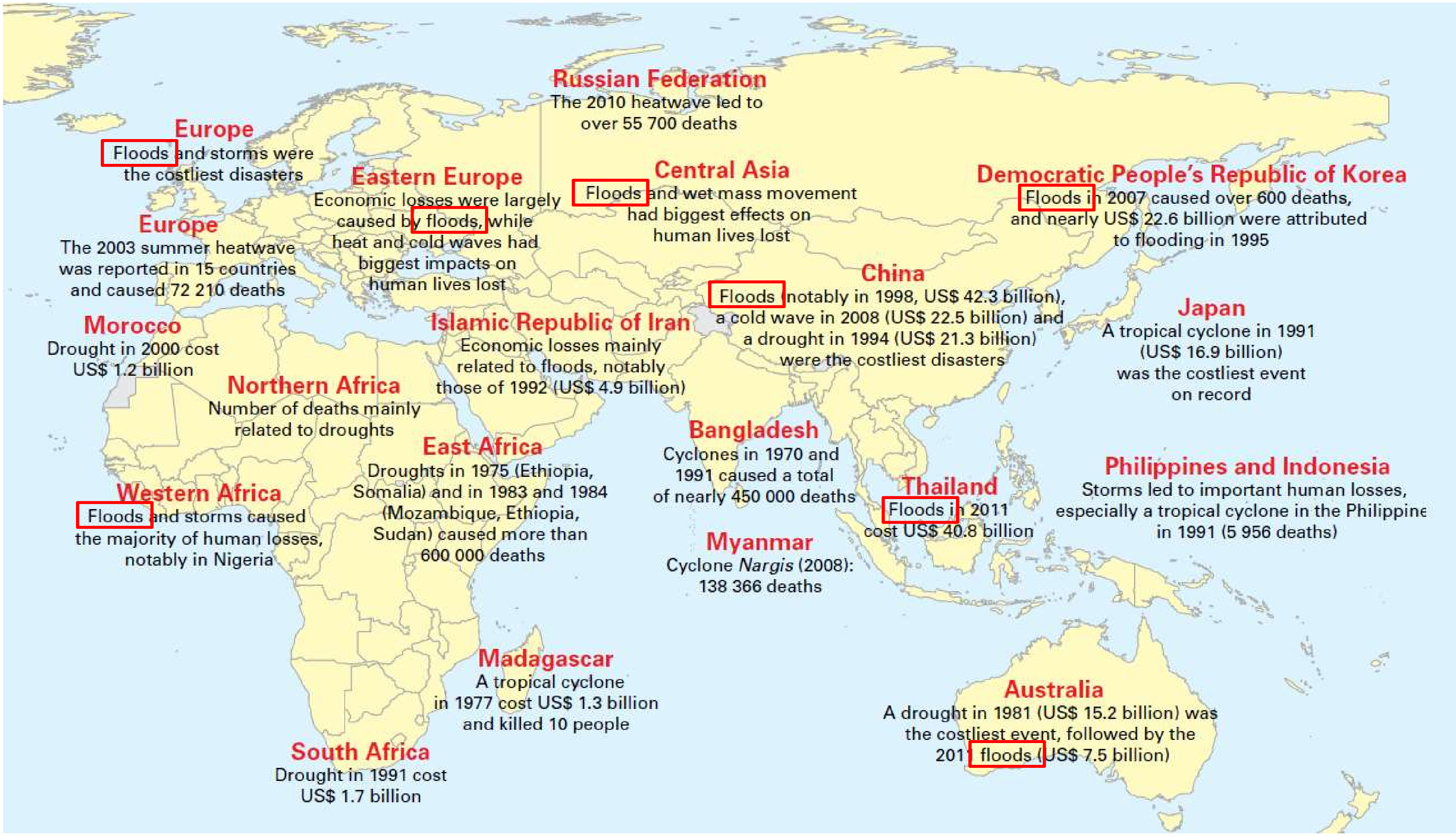
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Major reported disasters linked to weather, climate and water extremes

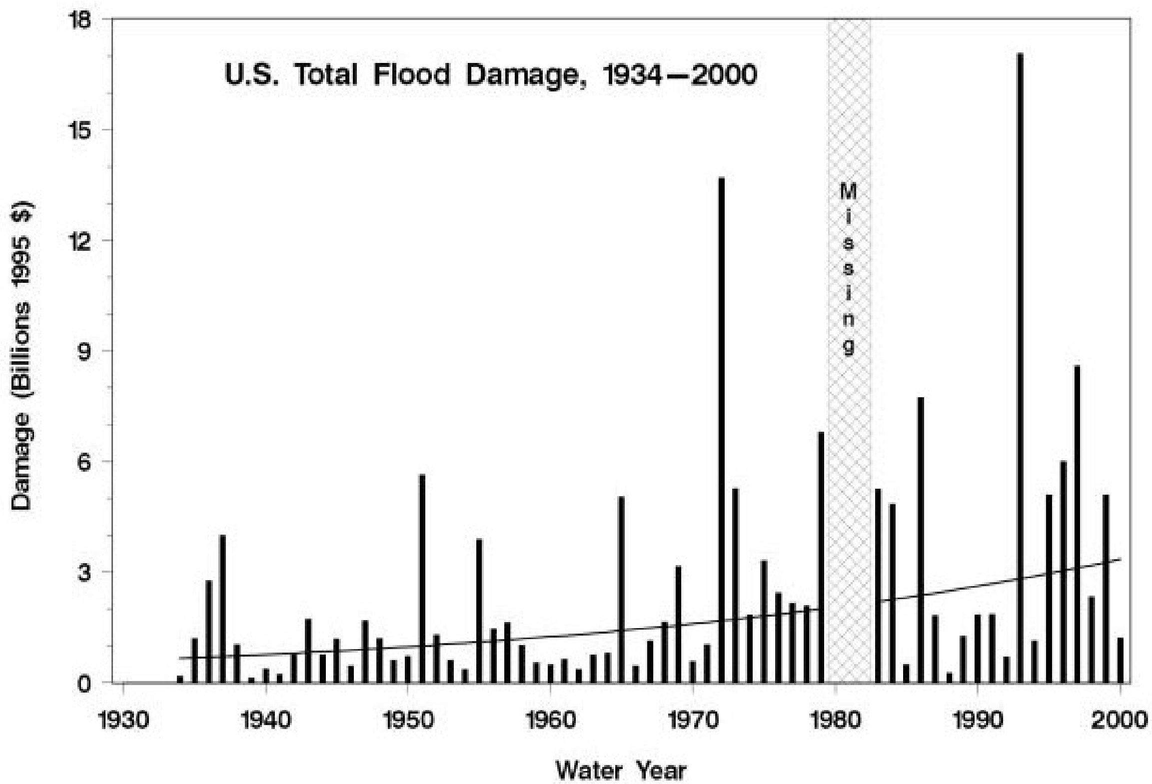


WMO Report: Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970 – 2012)

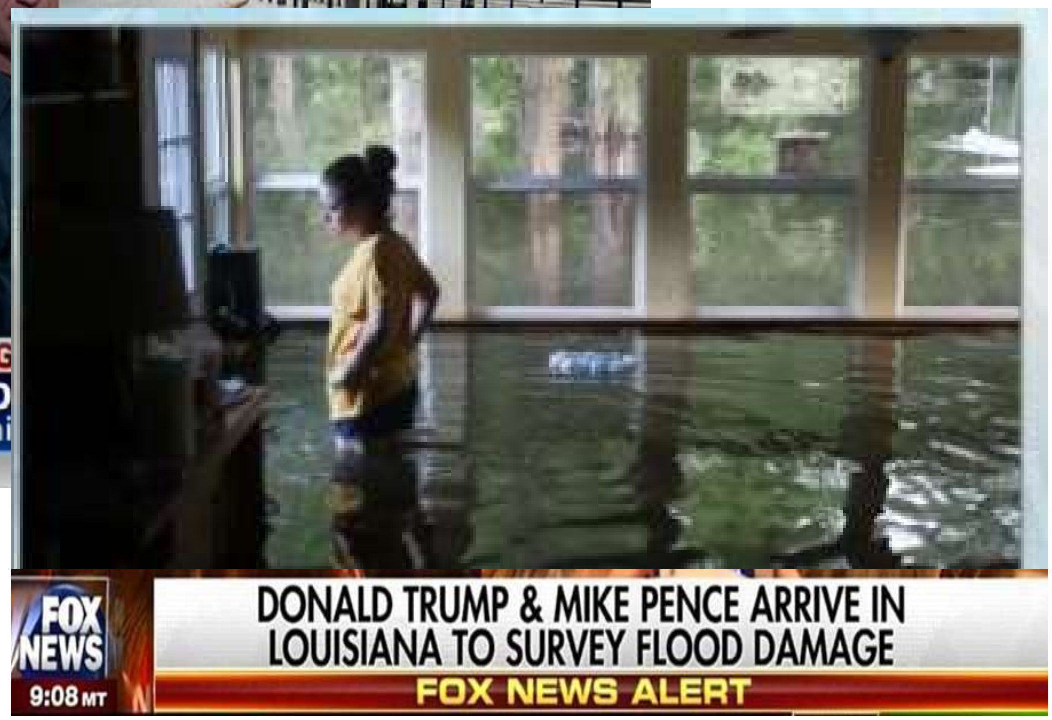
Flood Damages in the United States

MOST DAMAGING OF ALL NATURAL DISASTERS

- More than 50% of all deaths (US: 140 deaths/year)
- 1/3 of total economic loss (US: $6 billion/year)




Memphis, Tennessee
2:05 PM
DEVELOPING
FAST AND
Mississippi
>>> WORLD News


FOX NEWS
9:08 MT
DONALD TRUMP & MIKE PENCE ARRIVE IN
LOUISIANA TO SURVEY FLOOD DAMAGE
FOX NEWS ALERT

What can we do?

Dealing with Floods

Need for High Resolution Flood Mapping Capability

Example of Ohio Basin

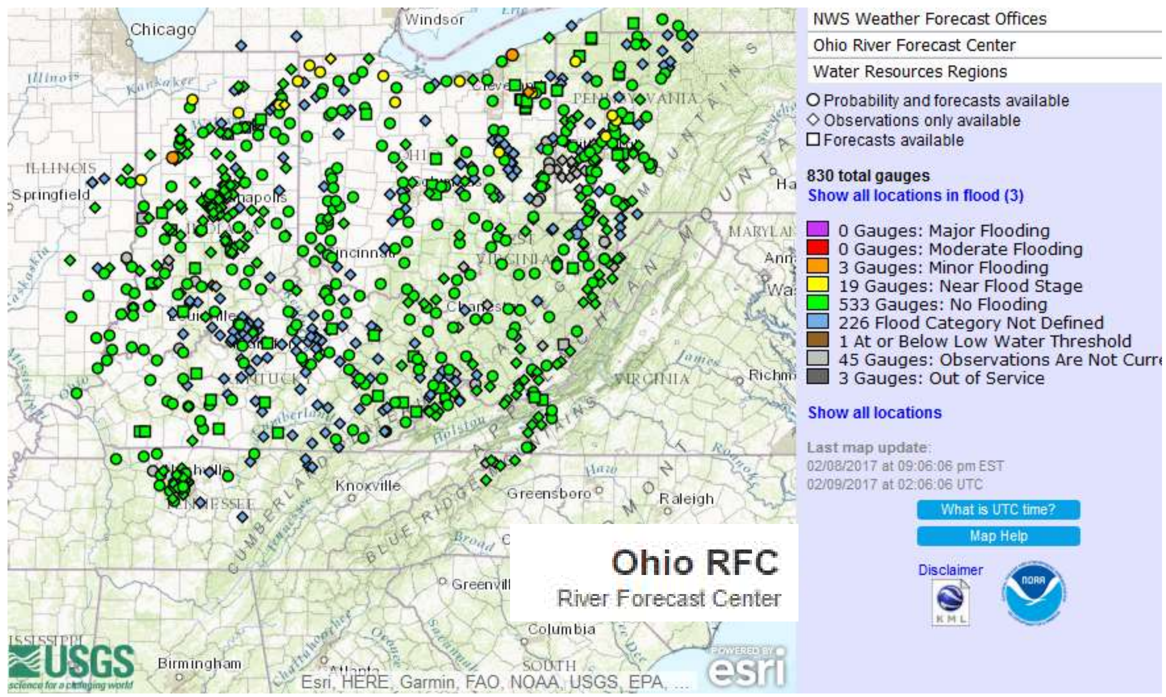
~800 streamflow gauging stations with continuous records

T) km^2

G r 700 km^2

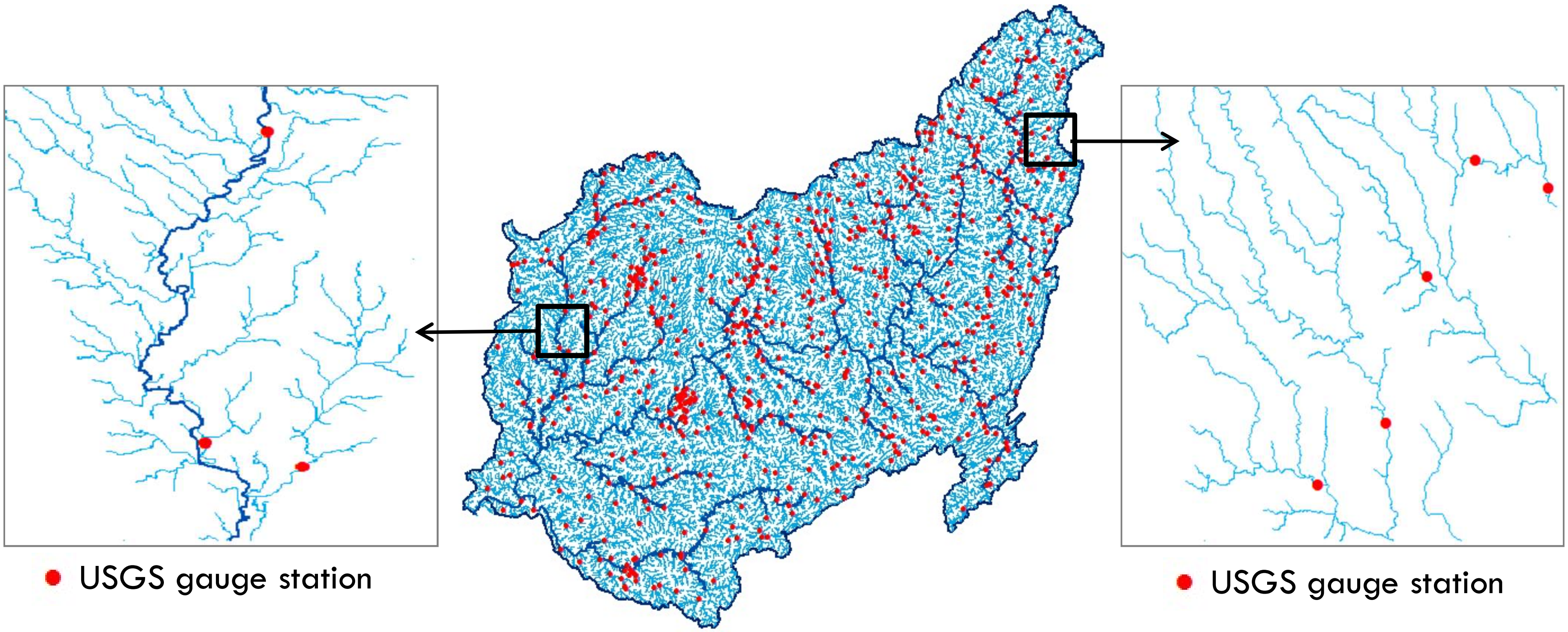
NATIONAL WEATHER SERVICE

http://www.weather.gov/ohrfc/



Motivation

Limitation in our current information capacity



<u>Number of NHDPlus Rivers/Streams</u>

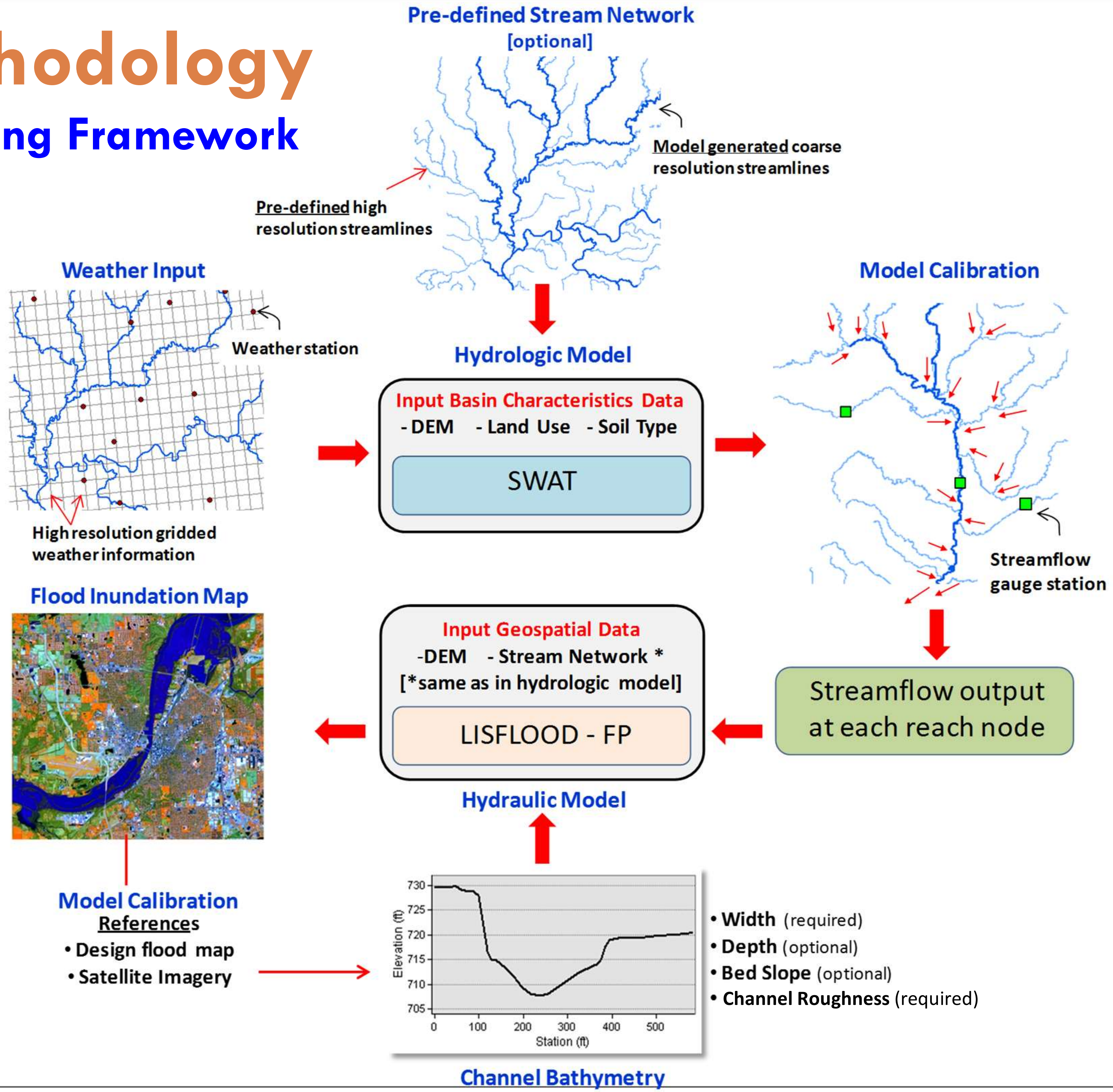
Ohio Basin ~ 100,000

Continental United States ~ 2.7 million

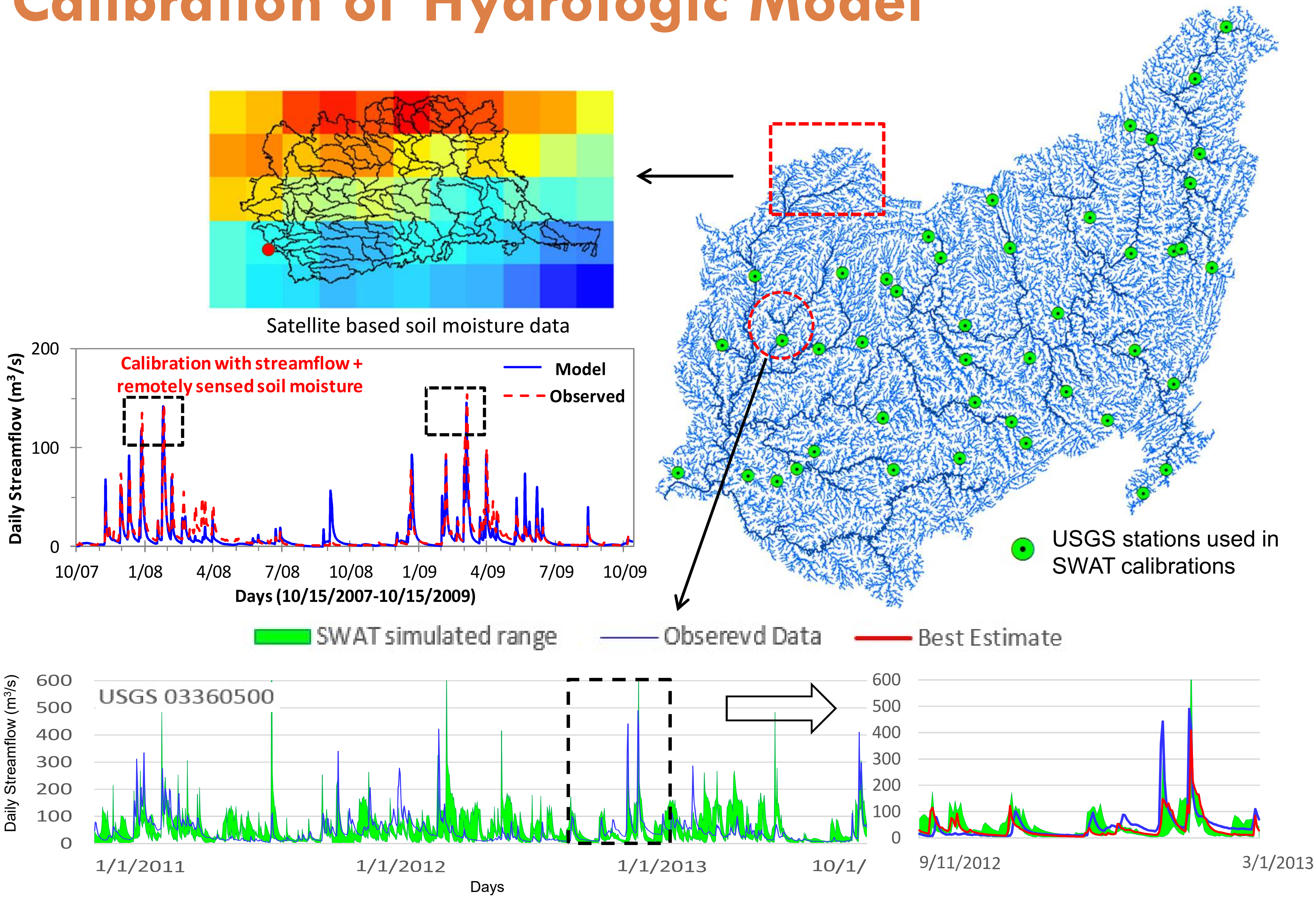
How can we generate near-real time information EVERYWHERE?

Methodology

Modeling Framework



Calibration of Hydrologic Model

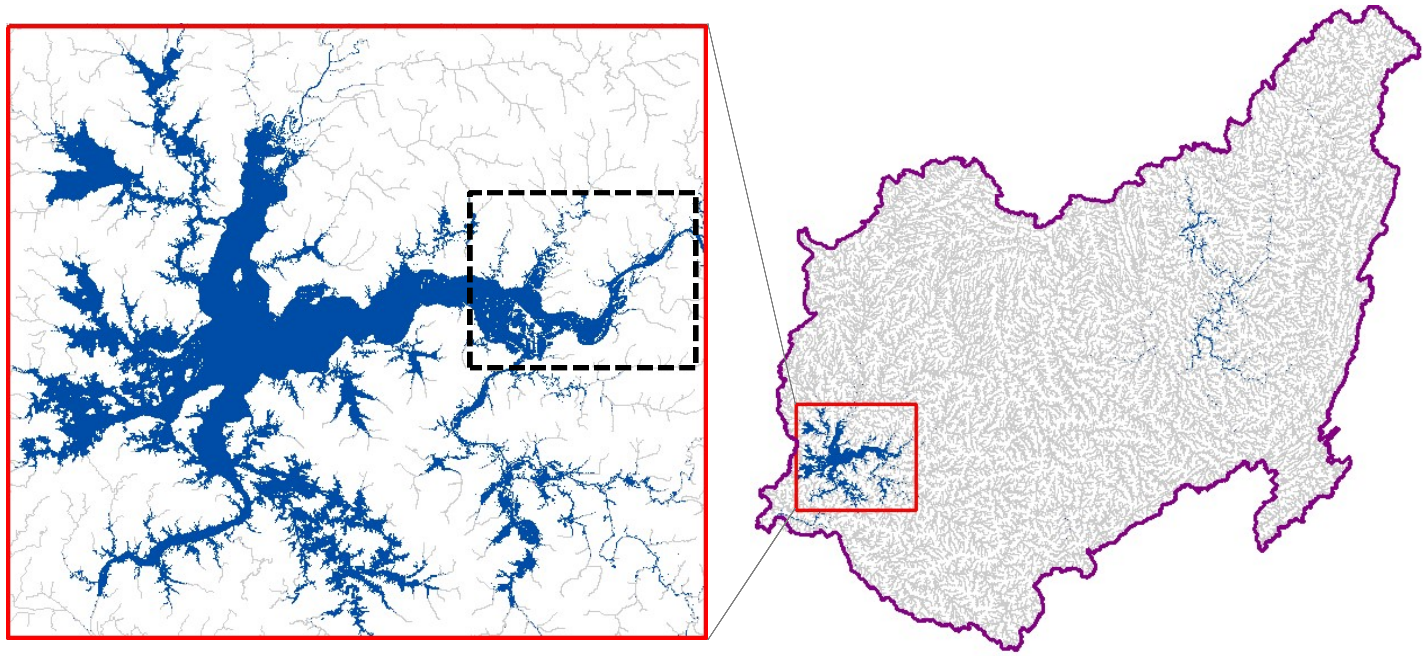


Evaluation for a Real Flood Event

Reference:

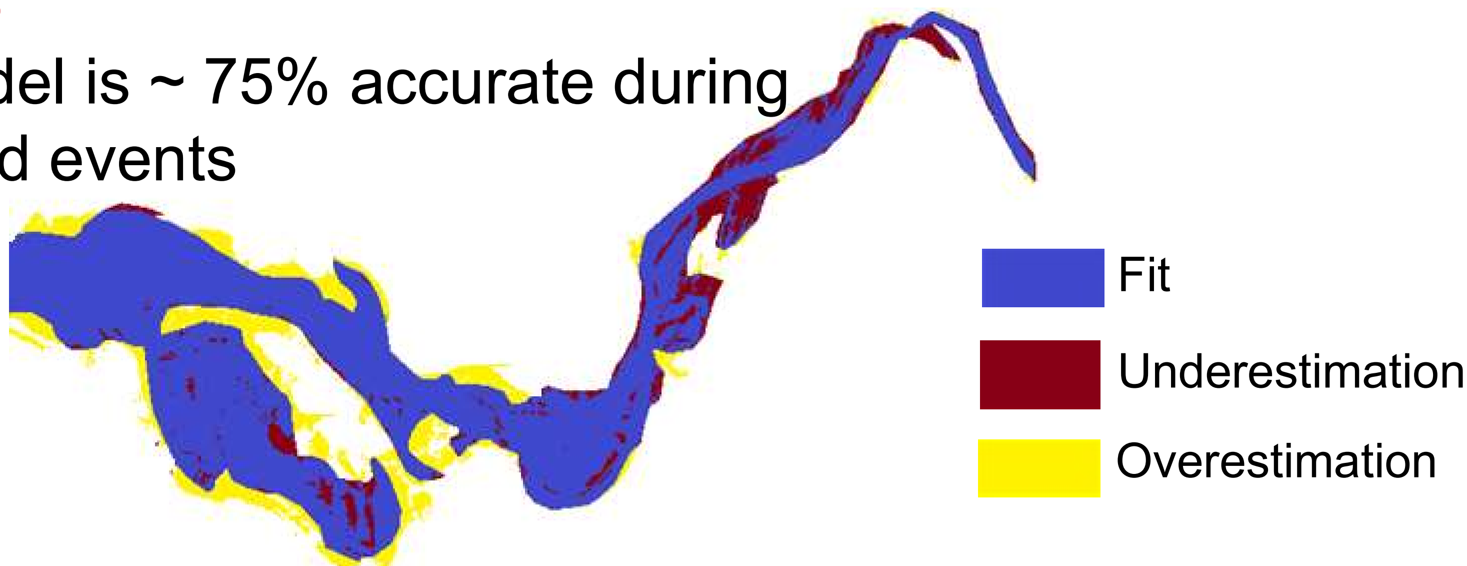
Landsat satellite

[May 4, 2011]



F = 0.75

Our model is ~ 75% accurate during real flood events



Realization of "Model Uncertainty"

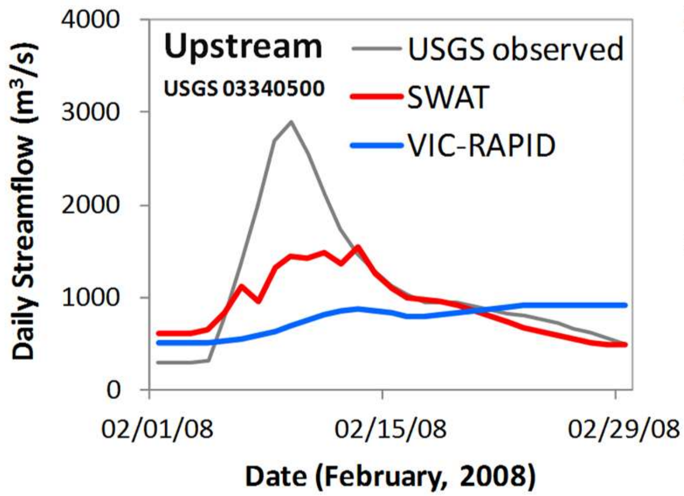
Model Uncertainty

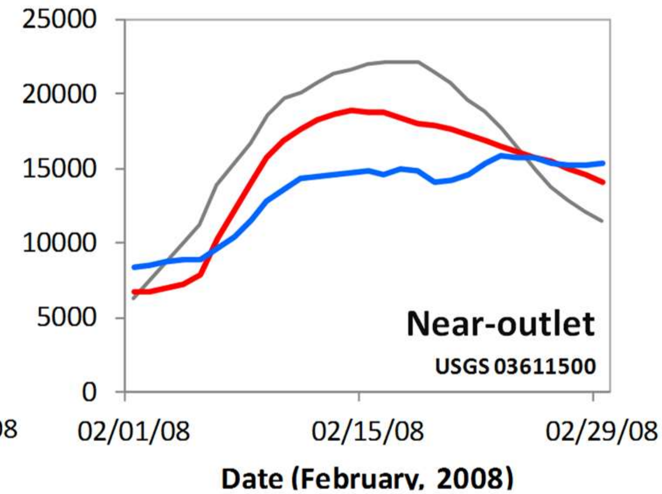
Input Uncertainty
- Weather
- Topography

✚

Hydrologic + Hydrodynamic Uncertainty
- Process representation
- Parameter equifinality
  - *- Two different models*
  - *- Two setups of the same model*

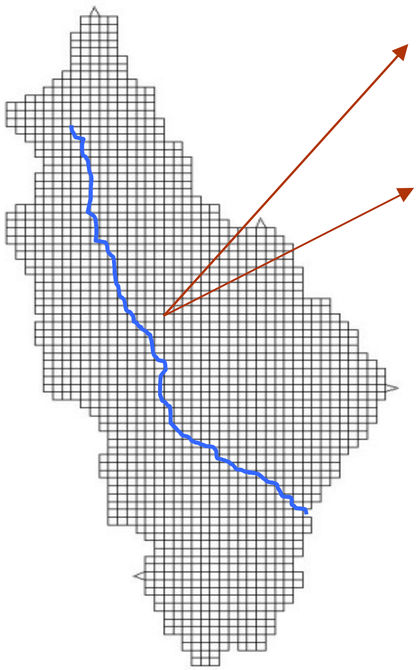
Streamflow comparison in Ohio Basin
SWAT vs. VIC-RAPID (same weather input)





Path to Realistic Predictions

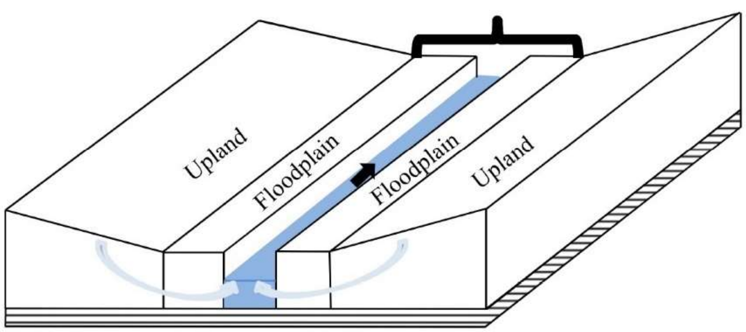
SWAT with Channel and Floodplain Properties?

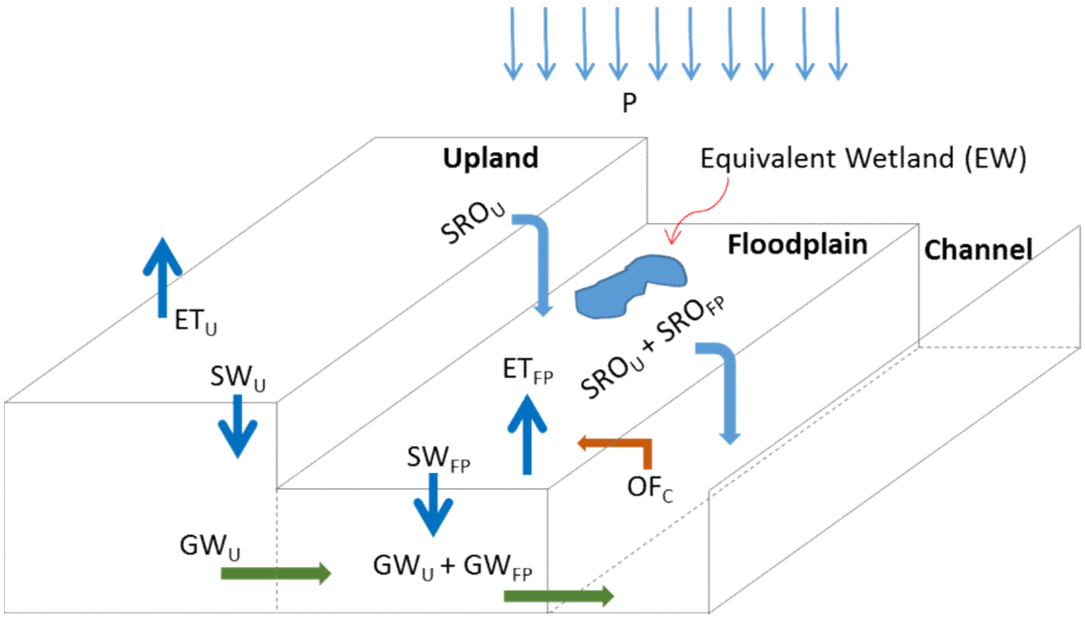


Most of the large scale land surface/ hydrologic models DO NOT have any floodplain representation (e.g. VIC, Noah-MP)

Hydrologic fluxes (surface runoff, baseflow) from the grids are generally dumped at the sub-basin outlet for routing

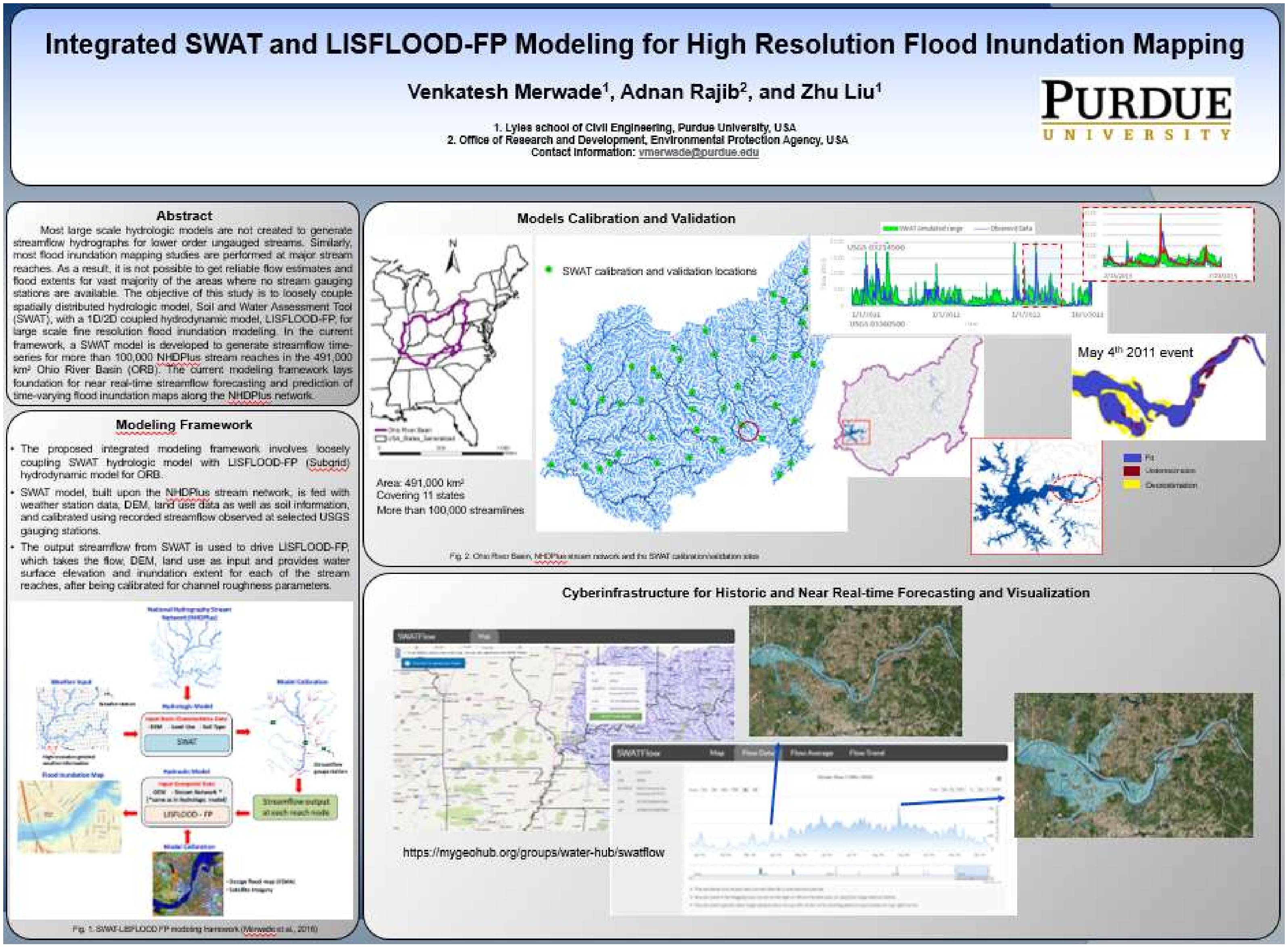
A new SWAT modeling approach that integrates channel and Floodplain information





Visit our poster tomorrow!

June 28,10.00 am



Questions?

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