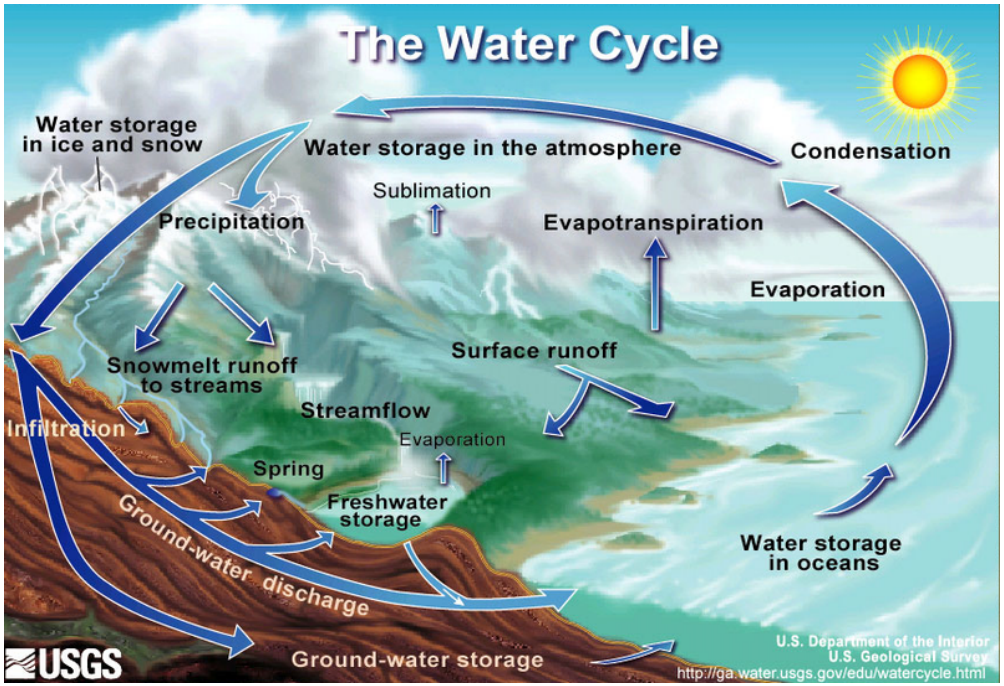
Atmospheric and Surface Water

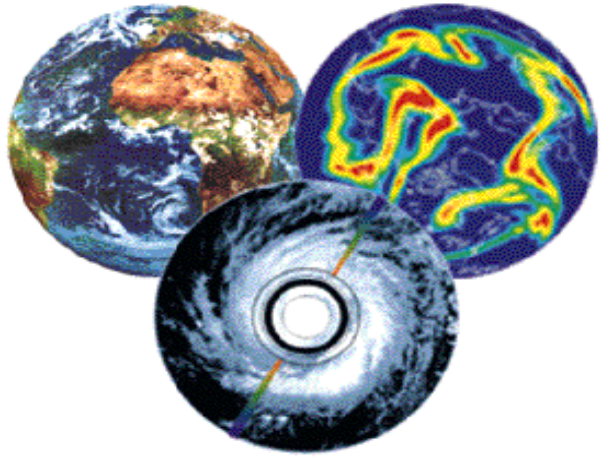
Pierre-Emmanuel Kirstetter

Motivation

Hydrology has been traditionally broken into sub-disciplines focusing on separate components of the water cycle



1.Observations *2.Theory/Models*



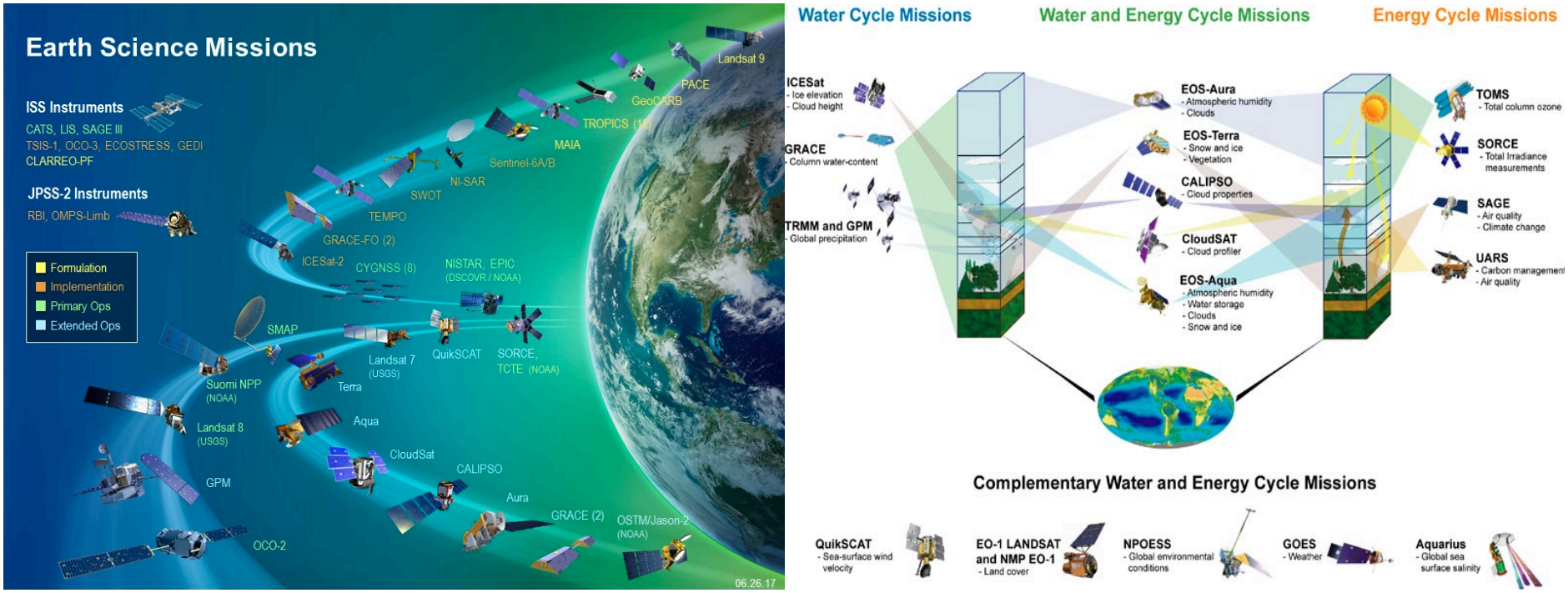
3. Prediction → Societal Benefits

→ emergence of a more comprehensive understanding of the water cycle and its components

→ bridge gaps between water science and engineering

Emerging ideas and paths forward in hydrology

Satellite remote sensing: multi-missions to sample the hydrologic column

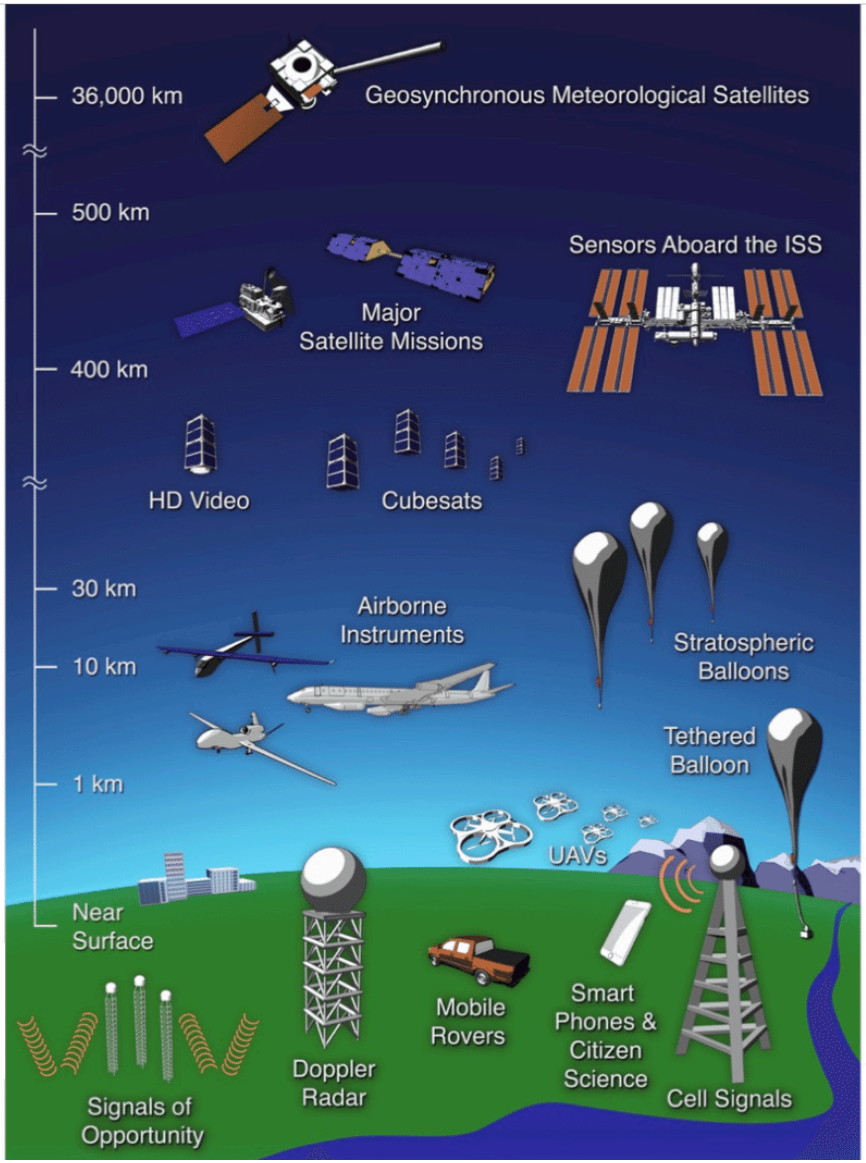


Courtesy NASA

Relevant strengths at the University of Oklahoma

Satellite
GOES-R

Global Precipitation Measurement



Radar networks
MRMS

Autonomous Sensing
CASS

Citizen scientists
mPING

Radar systems
PAIR, Horus

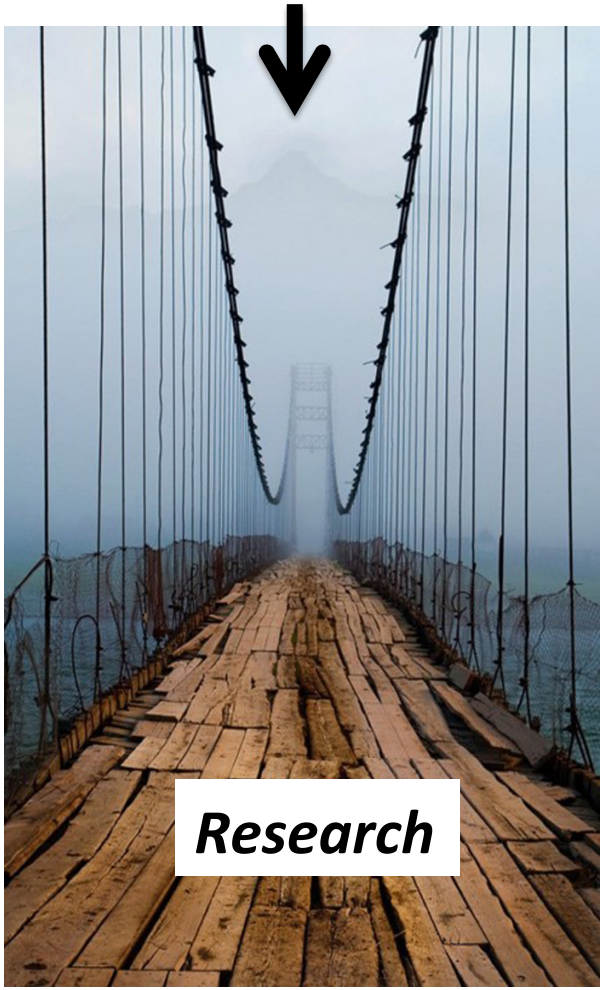
Hydrologic modeling
FLASH

Courtesy M. McCabe

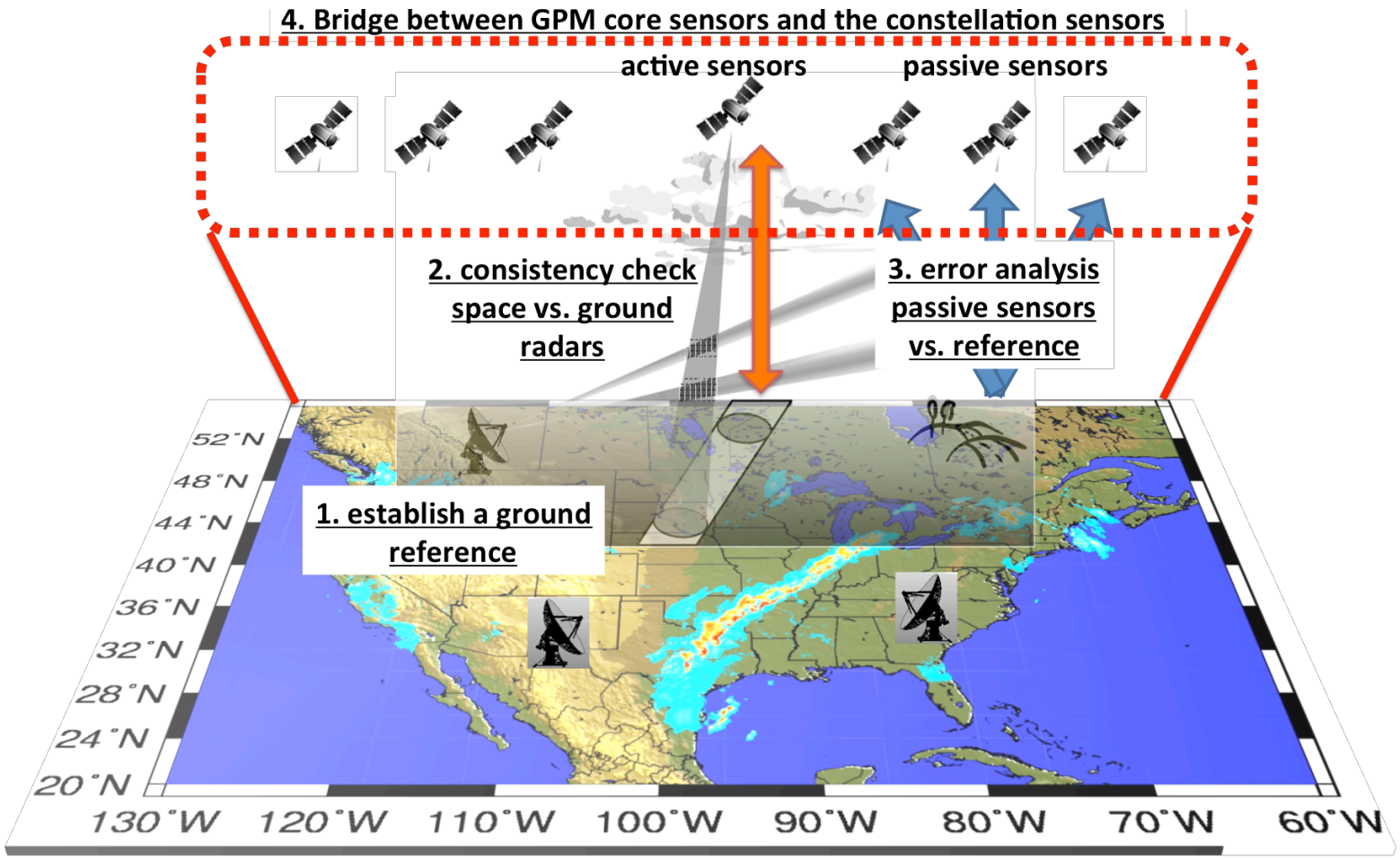
Relevant strengths at the University of Oklahoma

Unique ability to build and deploy systems from basic concept to application.

Operations



MRMS and the GPM / GOES-R missions

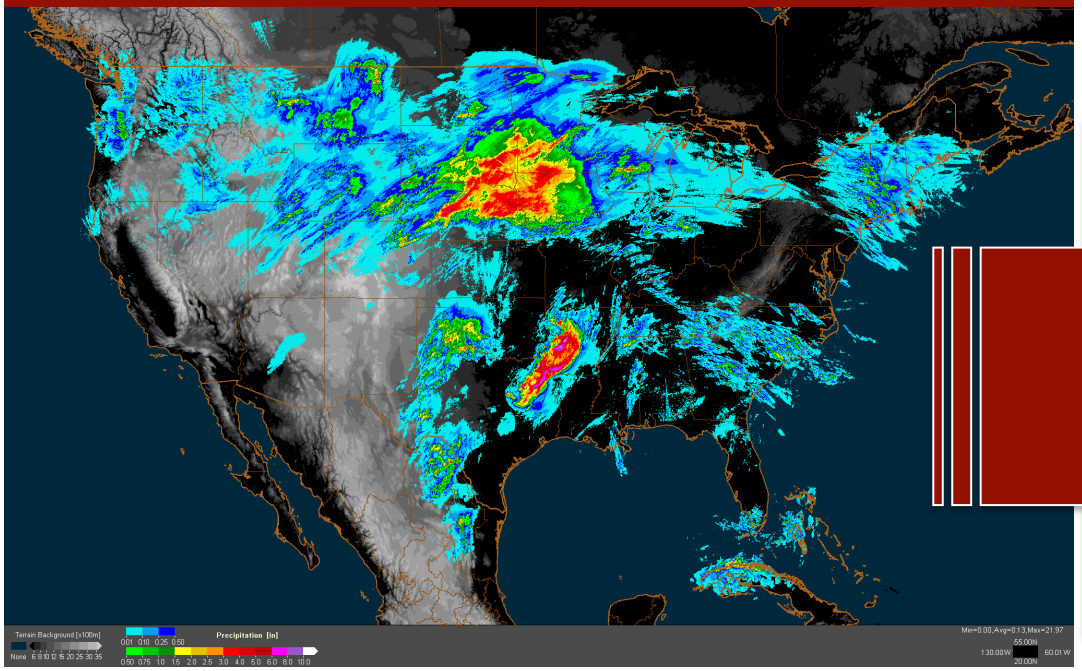


➔ Precipitation understanding at national and global scales

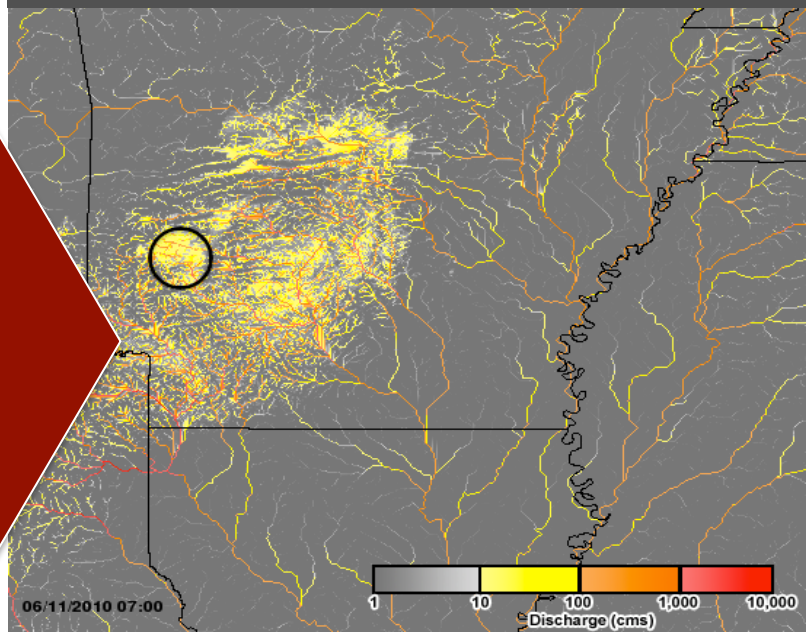
➔Flood monitoring and forecasting

Continental-scale Flash Flood Modeling
FLASH – Flooded Locations And Simulated Hydrographs

NEXRAD-based rainfall estimates from the Multi-Radar Multi-Sensor system



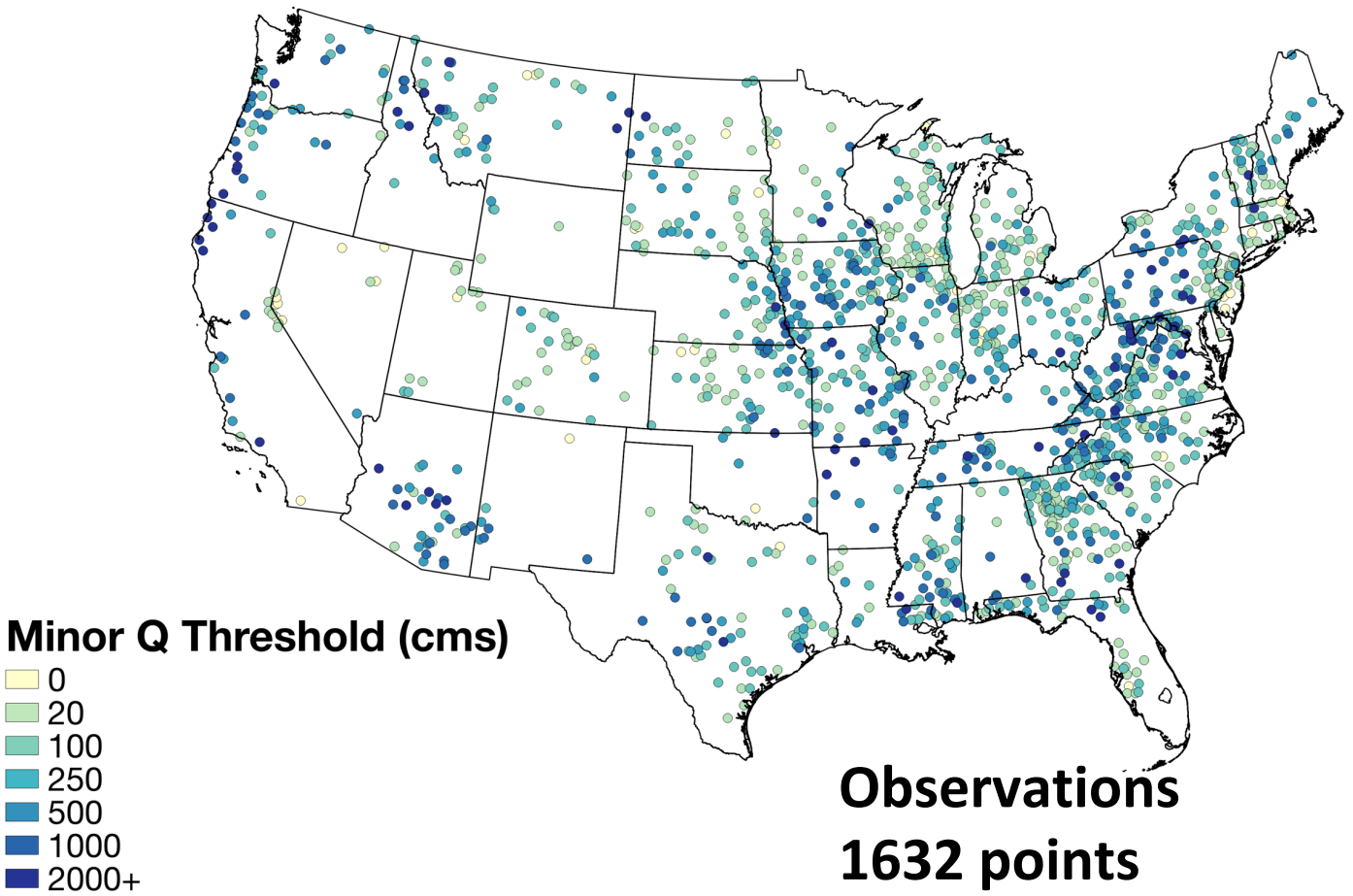
Hydrologic forecasts of flash floods downstream from the causative rainfall



➔ **Flash flood monitoring and forecasting by the National Weather Service.**

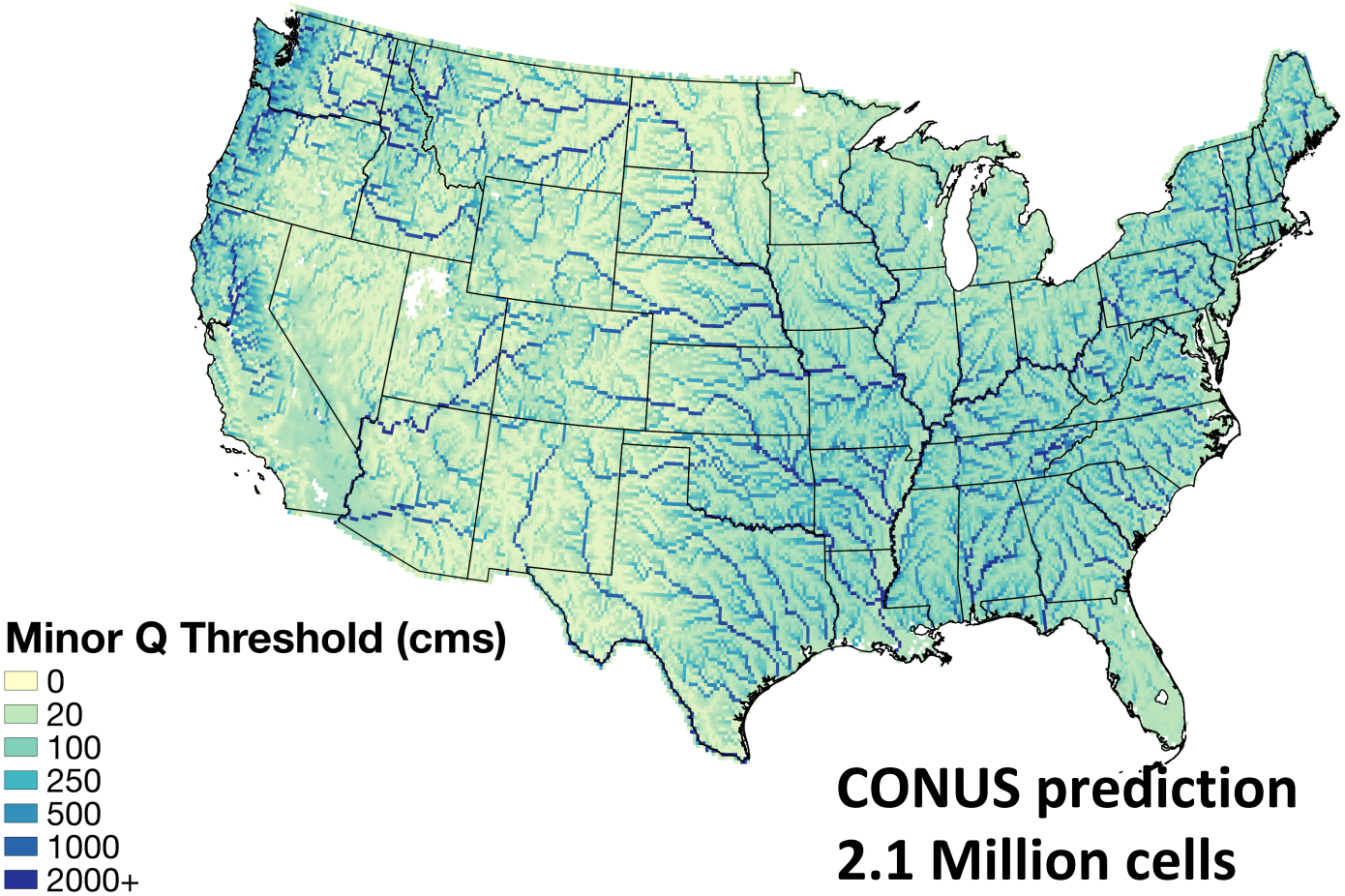
Prediction of flood risk

Prediction of probabilistic Minor Flood Stage



Prediction of flood risk

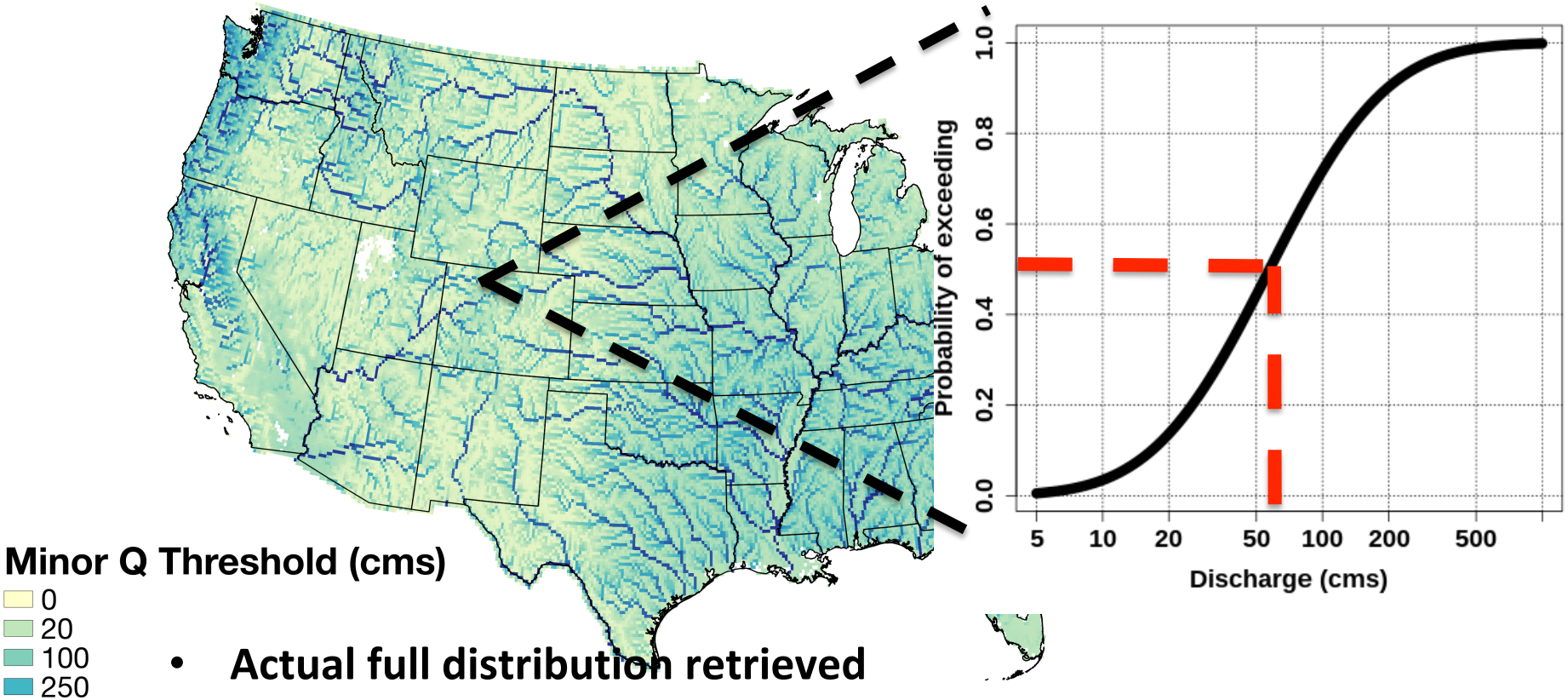
Prediction of probabilistic Minor Flood Stage



CONUS prediction
2.1 Million cells

Prediction of flood risk

Prediction of probabilistic Minor Flood Stage: risk assessment

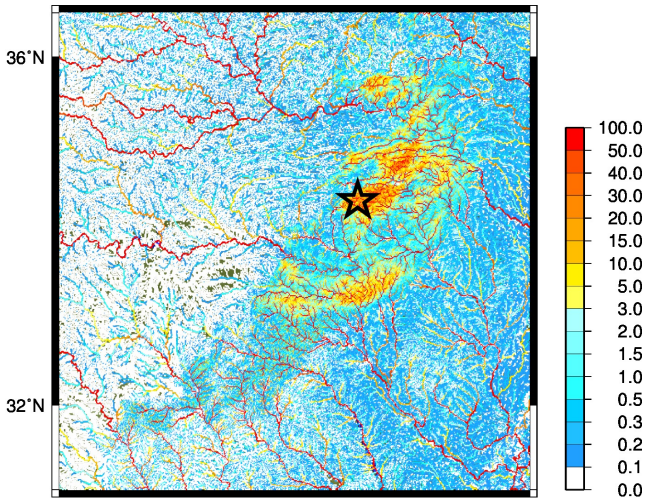


- Actual full distribution retrieved
- Discharge ⇔ probability of experiencing a Minor Flood
- Available for all flood stages at every location over the CONUS

Prediction of flood risk

Case 06/11/2010: Arkansas campground flash flood

FLASH prediction



http://flashflood.io/

Probability of flood stages