



Frontiers in Hydrology 2022

215: Advancing the State-of-the-Science of Water
Resources Modeling - Community Development at the
Intersection of Domain, Data, and Computer Sciences



A preliminary evaluation of Hydrologic Model Formulations in Nextgen

*Luciana Cunha, Keith Steven Jennings, Fred L. Ogden, Naoki Mizukami, J. Michael Johnson,
Yuqiong Liu, Wanru Wu, Xia Feng, Rachel McDaniel, Scott Dale Peckham, Jessica L. Garrett ,
Shengting Cui, Nels J Frazier, Andy W Wood, Matt Williamson, Trey Flowers*

Nextgen: inviting the community

Multiple processes = multiple models





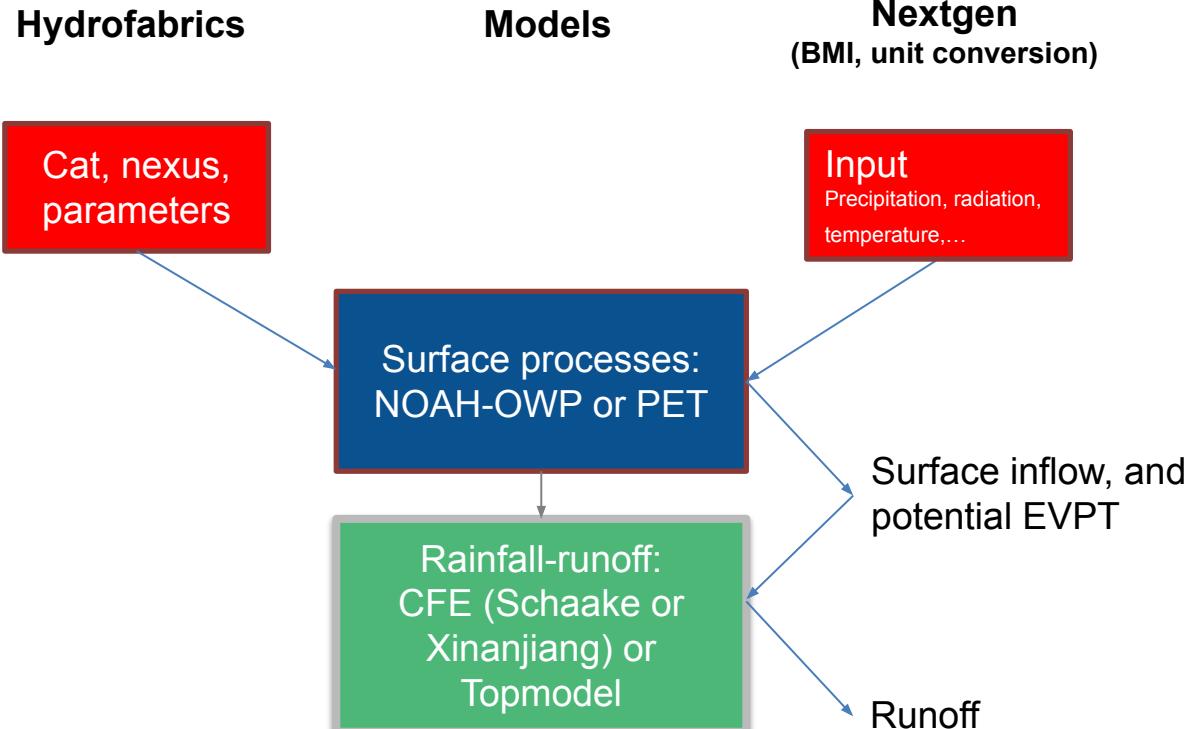
 **OWP** | OFFICE OF
WATER
PREDICTION

Models

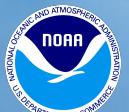
- NOAH-OWP-Modular (Fortran)
- Potential ET routines - PET (C)
- CFE (C)
- TOPMODEL (C)
- LSTM (python) - 2nd report
- Soil Freeze Thaw model (C++) - 2nd report



Pieces of the puzzle



**Not calibrated



OWP | OFFICE OF
WATER
PREDICTION



OWP OFFICE OF
WATER
PREDICTION

Colorado SPLASH Soil Moisture Survey, October 2021

1st report

*Error detection
Water balance
General performance
Model understanding
(sensitivity analysis)*



NOAA NWS Office of Water Prediction

Nextgen Baseline Performance Evaluation

Technical Report

Date: March 31st, 2022

Submitted To:

NOAA NWS
Office of Water Prediction
205 Hackberry Lane
Tuscaloosa, AL 35401

Submitted By Lynker

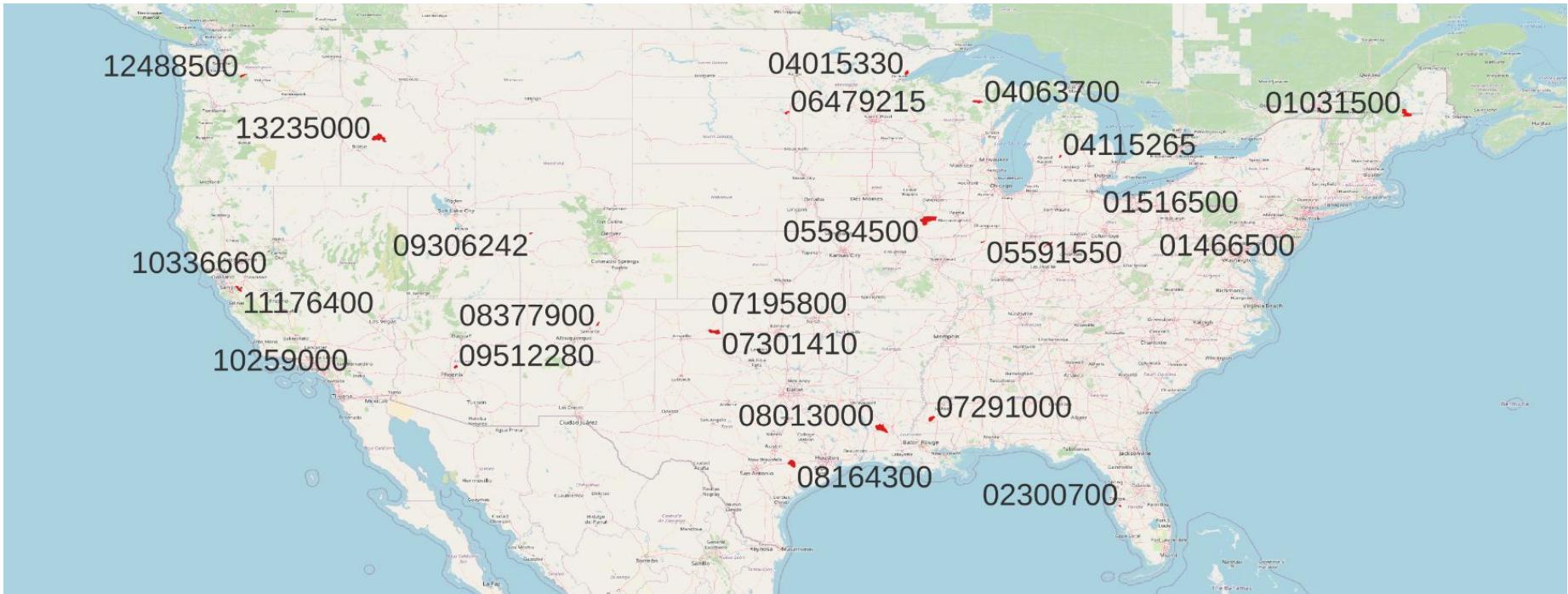
Lead Authors:
Luciana Kindt da Cunha, PhD (WEST Consultants)
Keith Jennings, PhD (Lynker)



2nd report - ongoing

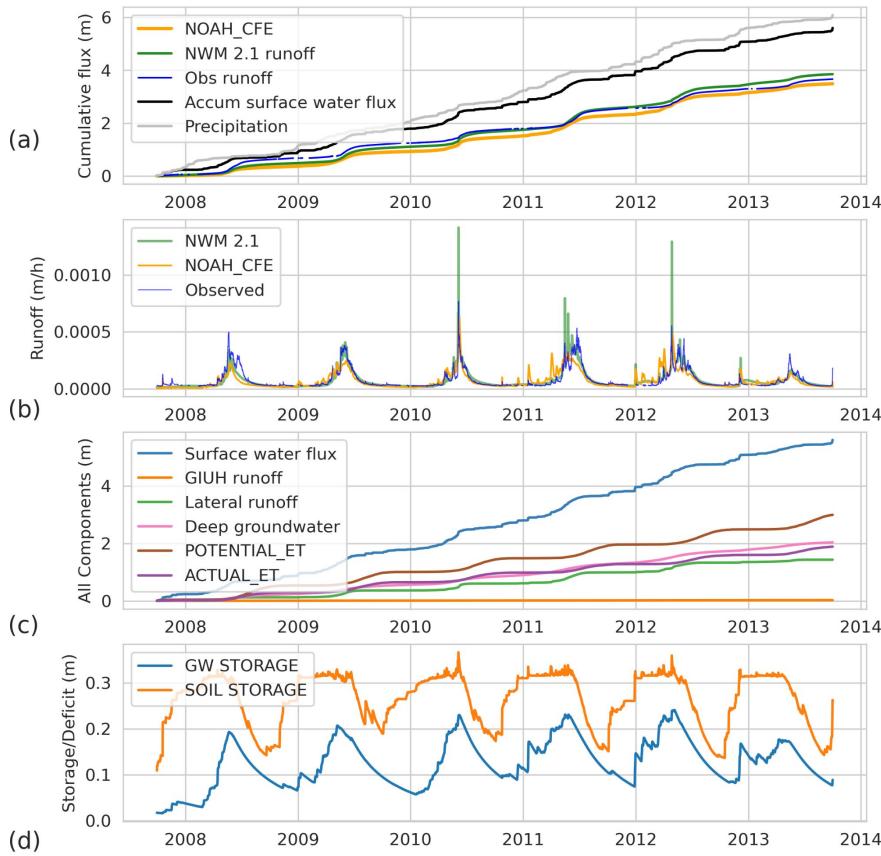
*Improving performance: model improvements and informed calibration
Other models (LSTM, Freeze and Thaw)*

1st report: 24 CAMELS

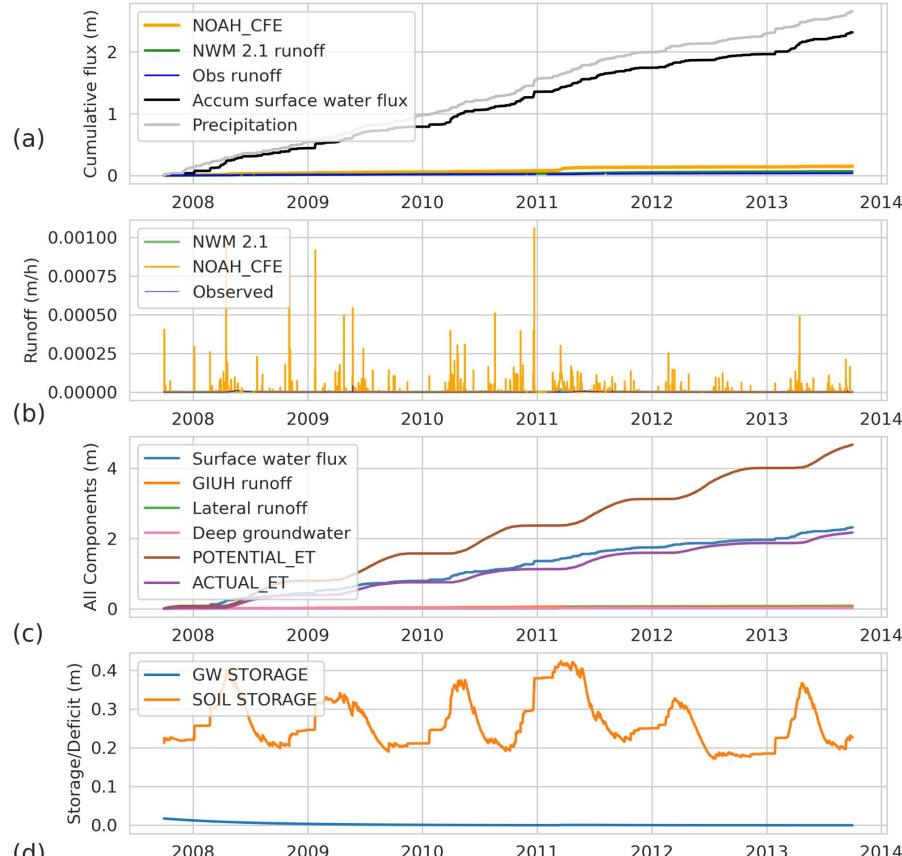


1st report: evaluate water balance and processes

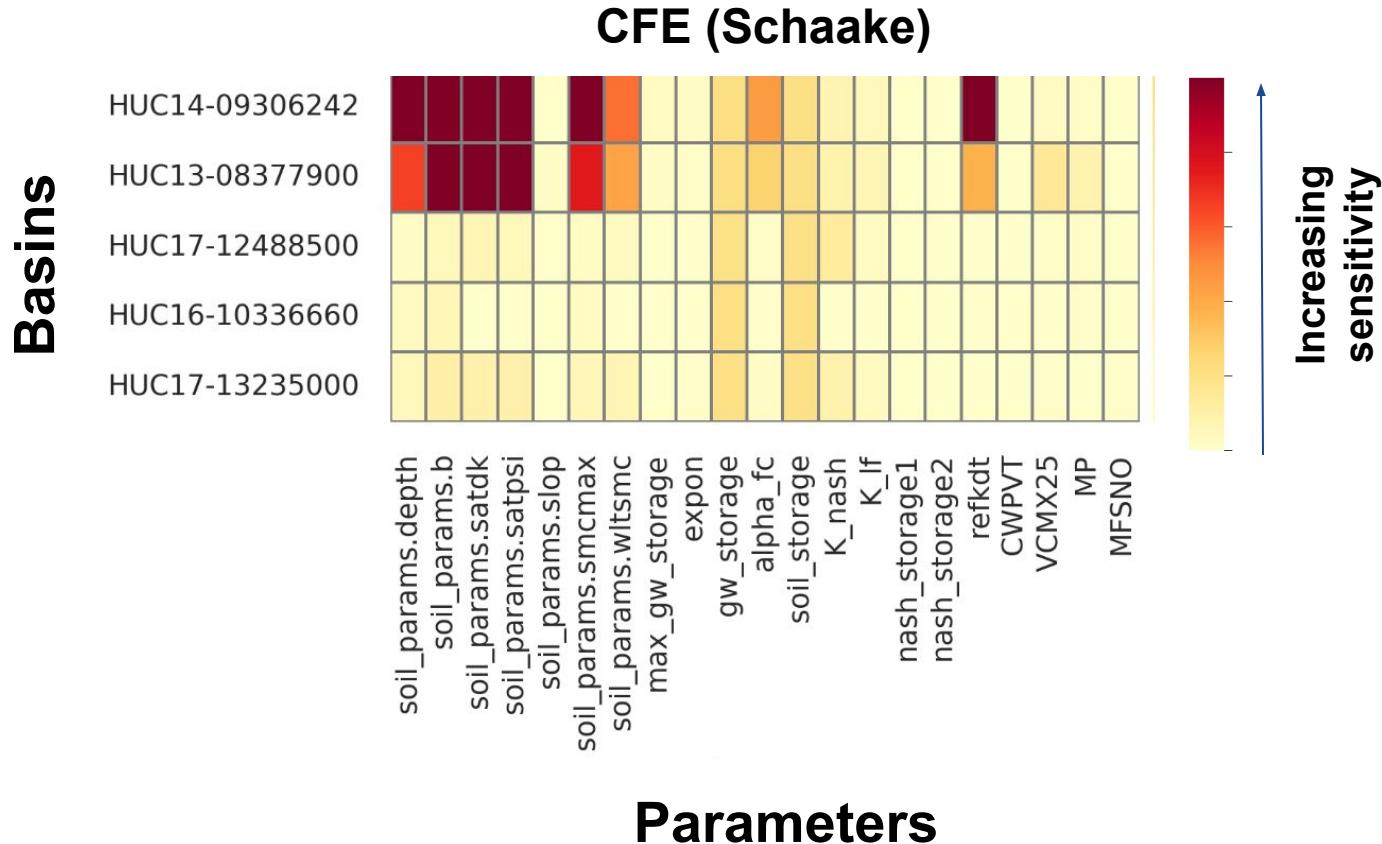
SOUTH FORK PAYETTE RIVER AT LOWMAN, ID



CORRAL GULCH NEAR RANGELY, CO

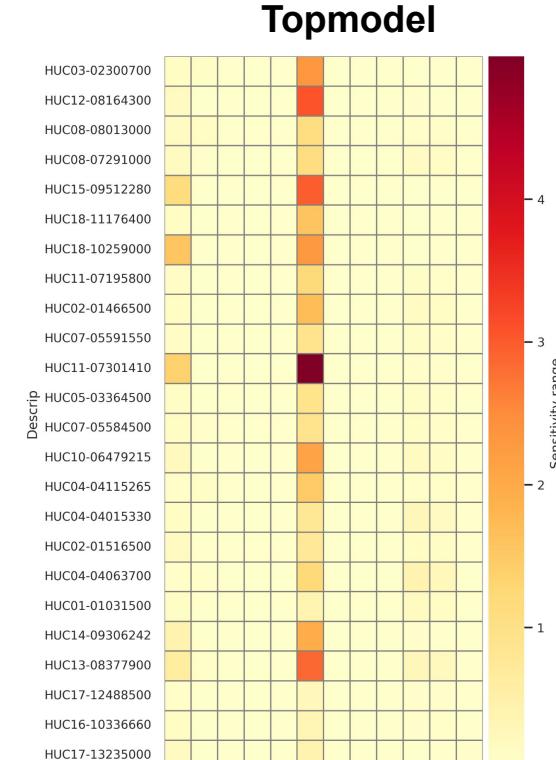
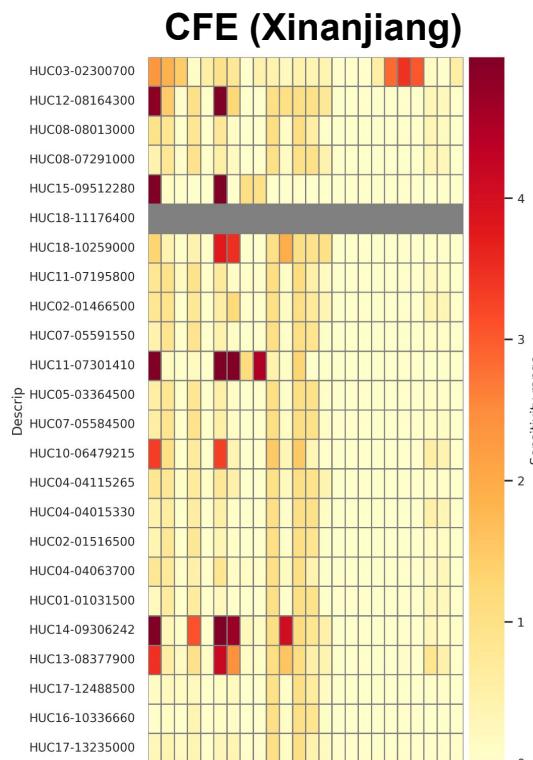
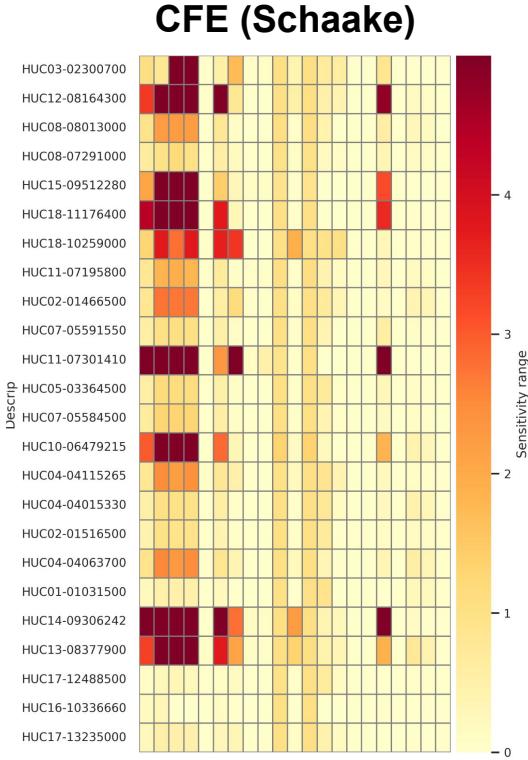


1st report: sensitivity analysis - runoff volumes



1st report: sensitivity analysis - runoff volumes

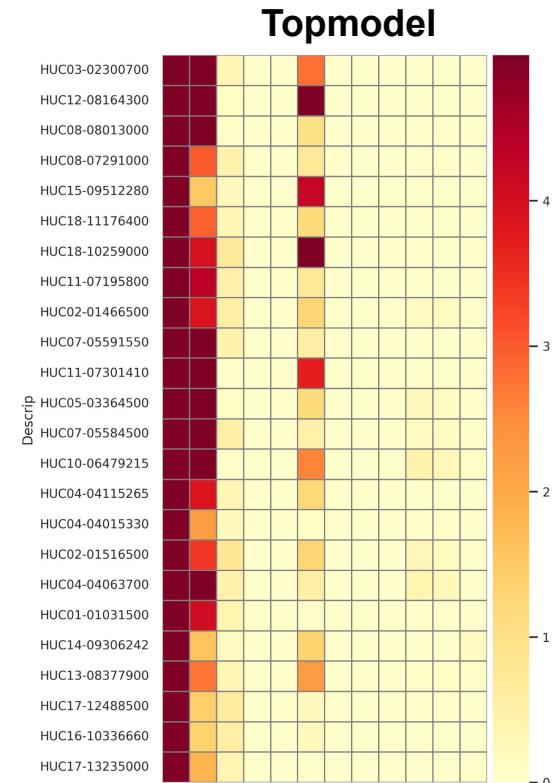
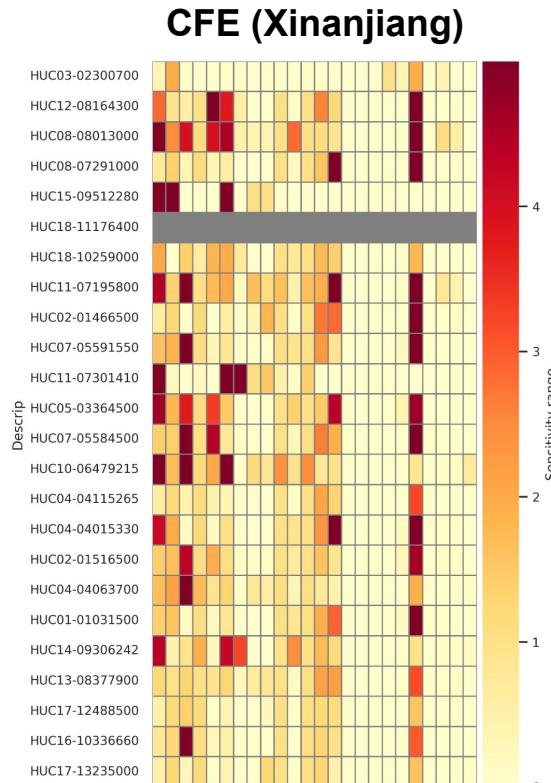
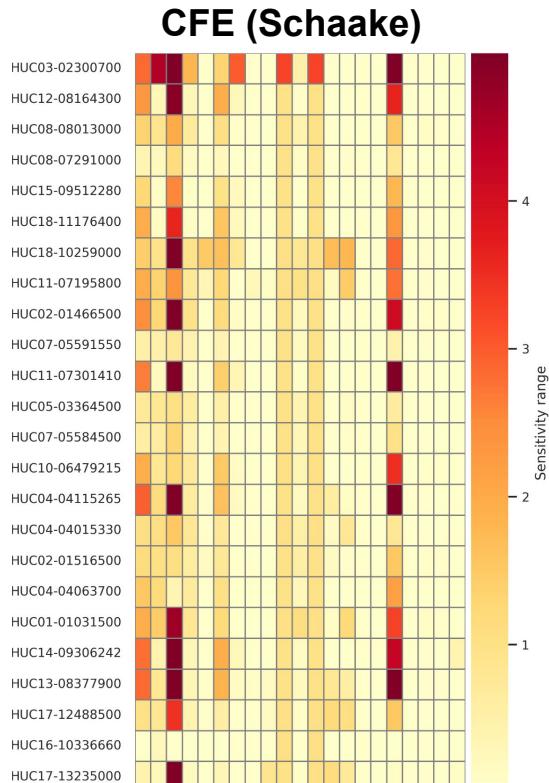
Basins



Parameters

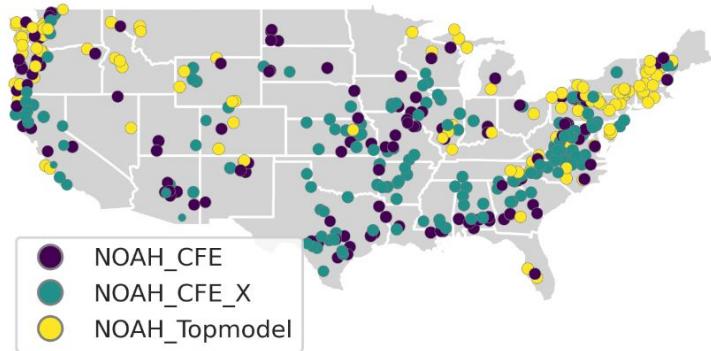
1st report: sensitivity analysis - peak runoff

Basins

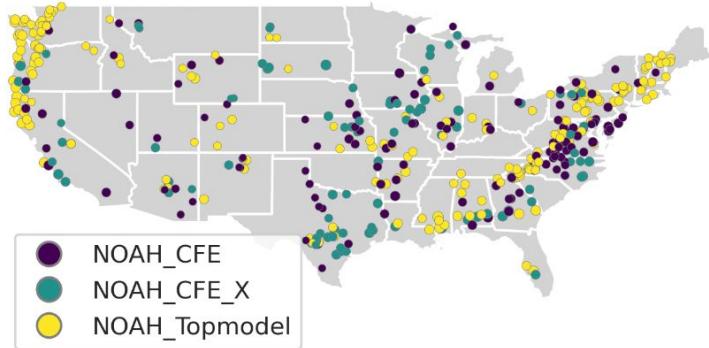


Parameters

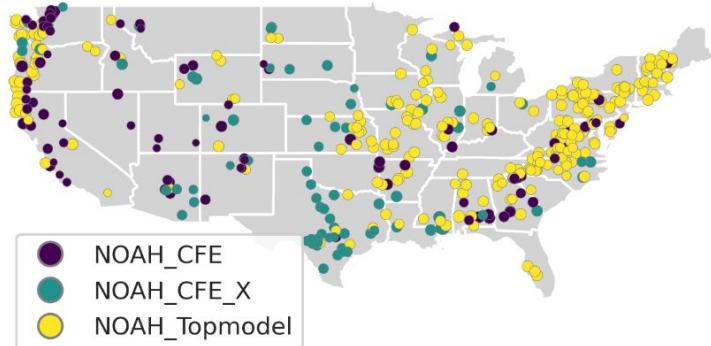
2nd report: Larger scale model evaluation



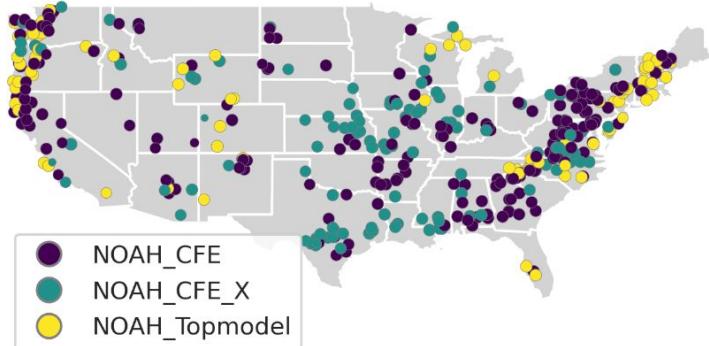
Hydrological Signature



Thread Score ($Q > Q95$ percentile)

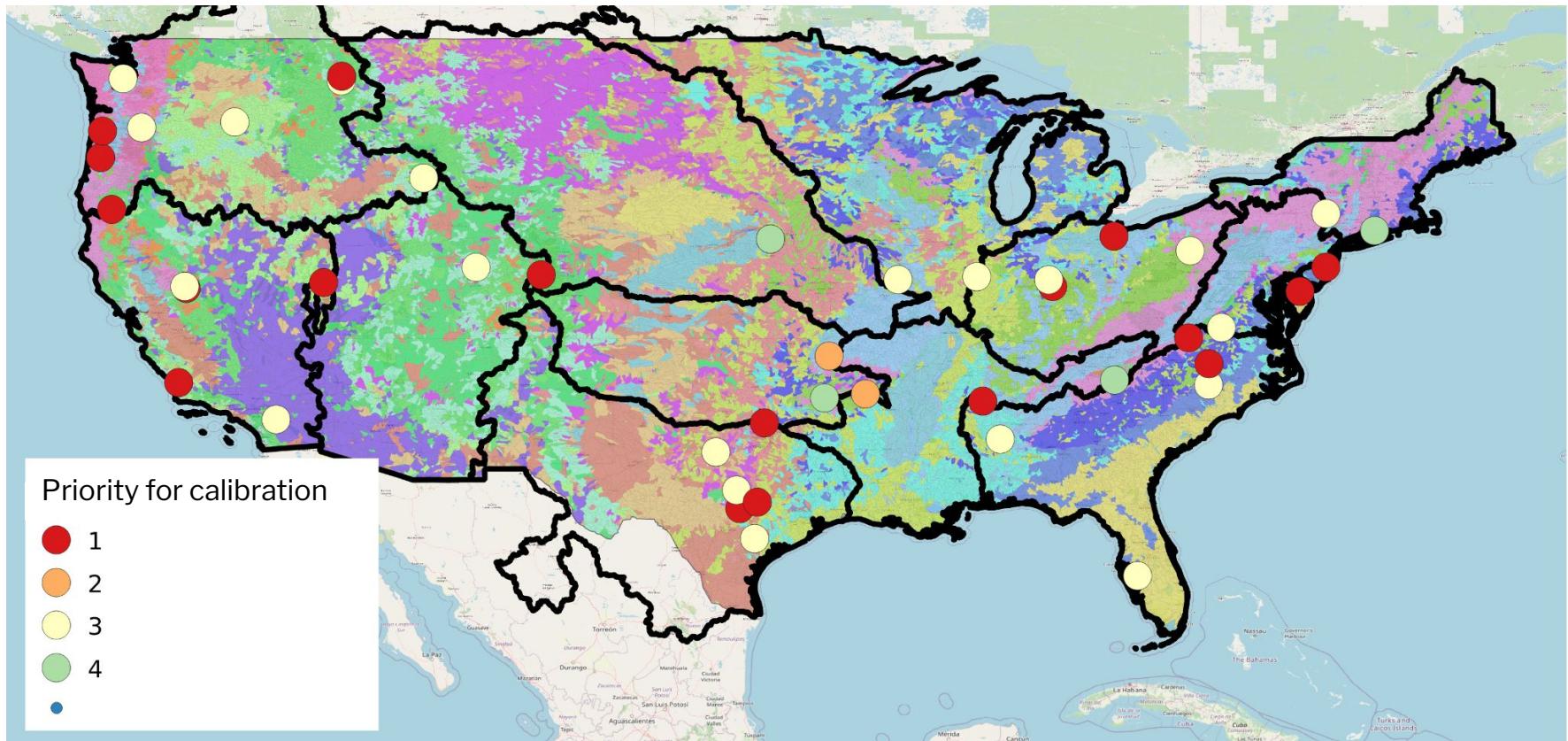


Normalized Nash



KGE

2nd report: Informed Calibration (within Nextgen)



Join us

*Comprehensive, reproducible,
cost efficient **model**
intercomparison capabilities
across multiple hydro-climates
and landscapes, temporal and
spatial scales, and dominant
processes*

Github



AGU Presentations





Thank You!



Luciana Cunha



luciana.kindl.da.cunha@noaa.org



<https://water.noaa.gov>

OWP | OFFICE OF
WATER
PREDICTION

