



Soil moisture conditions and uncertainties in inflow prediction

Farhad Hassani

Xuan Wang

Yu Zhang

Department of Civil Engineering
The University of Texas at Arlington

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Background and Motivations

- Inflow predictions is a key to reservoir flood operations and drought planning
- Event-based models used by Corps and River Authorities
 - Requiring initial/constant losses
- Method for calculating loss from soil moisture not tailored to reservoir inflow models
- Various national soil moisture products feature limitations

Objectives

- Develop a new, near-real time soil moisture and anomaly product for State of Texas
 - More accurately depict watershed conditions/runoff potential
- Create loss estimate directly usable in HEC-RTS
 - Improve reservoir inflow predictions for major rainfall events

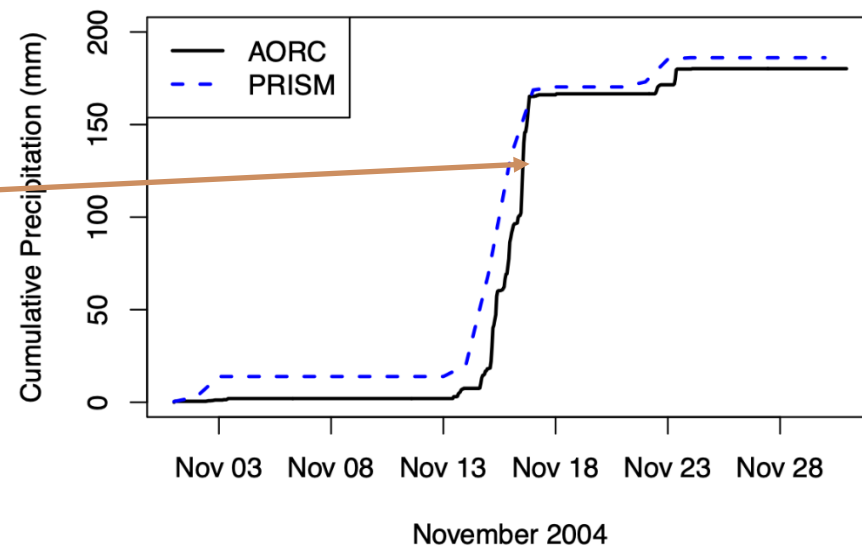
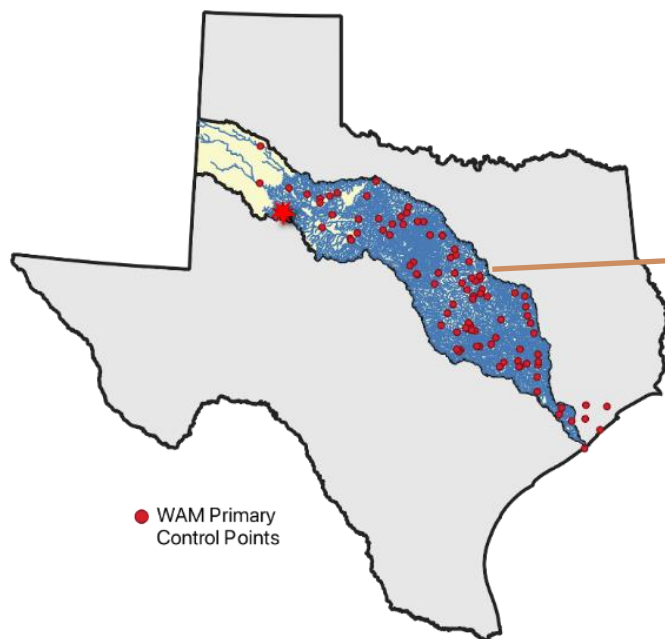
Presentation Outline

- Configuration of UTA-LIS and workflow
- Model improvements and impacts on
 - Soil moisture norm and anomalies
- Loss estimate bases on the UTA-LIS

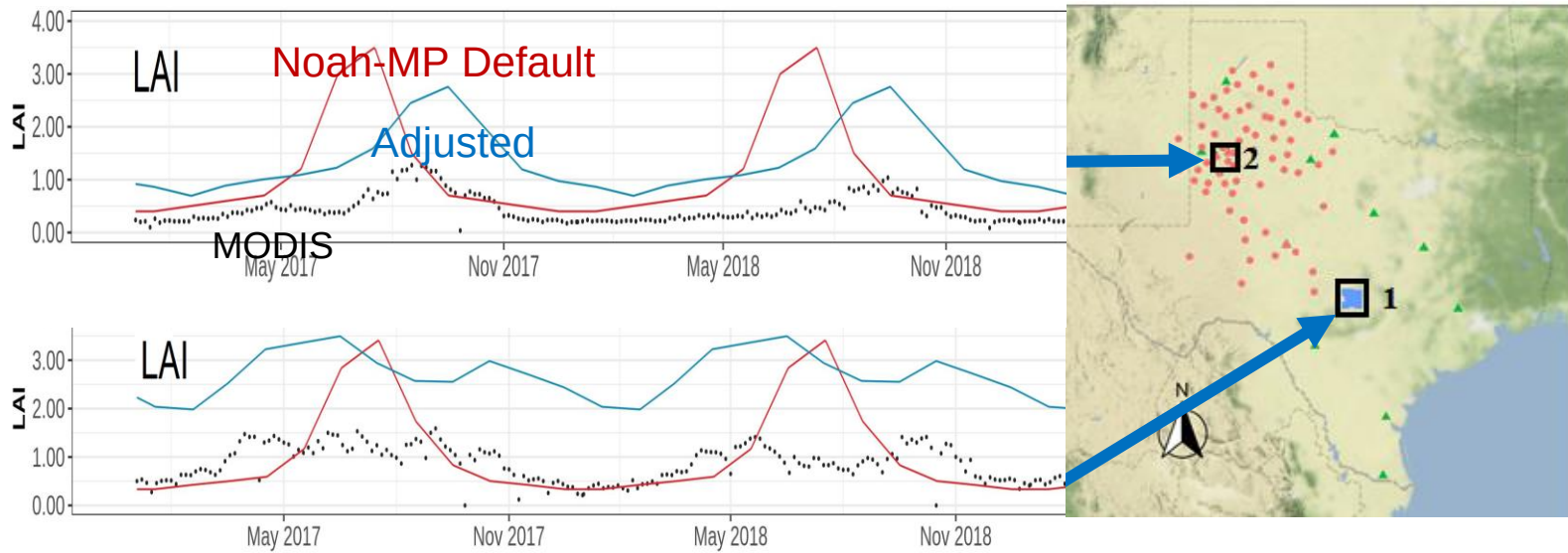
Correction of Precipitation Product

- NLDAS-2 precipitation product
 - Based on gauge analysis
 - Severely biased for heavy rain

Hourly AORC for each pixel in Texas is corrected to match daily PRISM accumulations



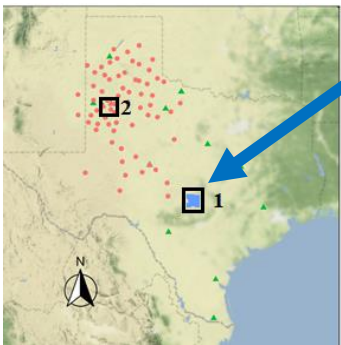
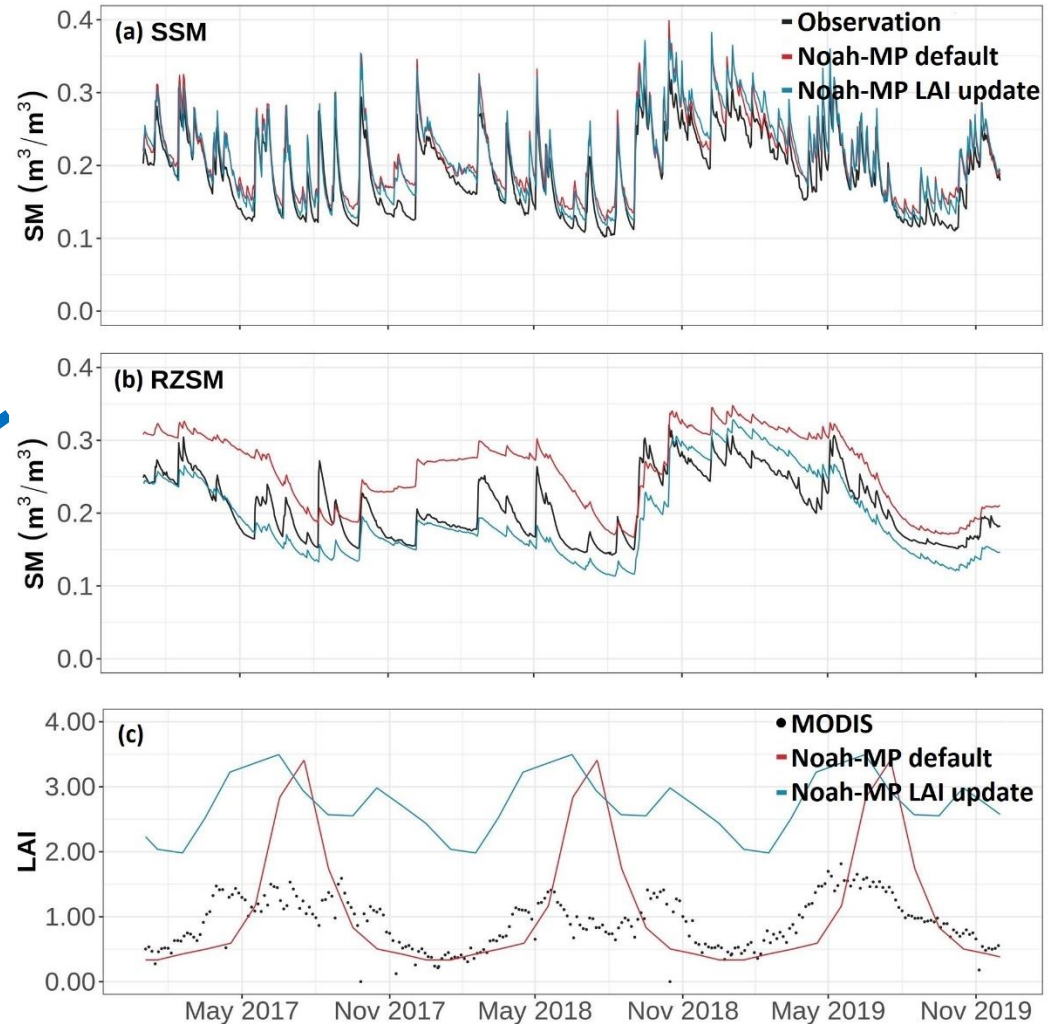
Improving Vegetation Phenology



- Comparison of NLDAS-2 and Noah-MP LAI against MODIS product -> former more accurately represent seasonal cycle of vegetation in TX

Improvements of Soil Moisture

- Effect of LAI correction on the dynamic of surface SM and root zone SM: **on an energy-limited location**

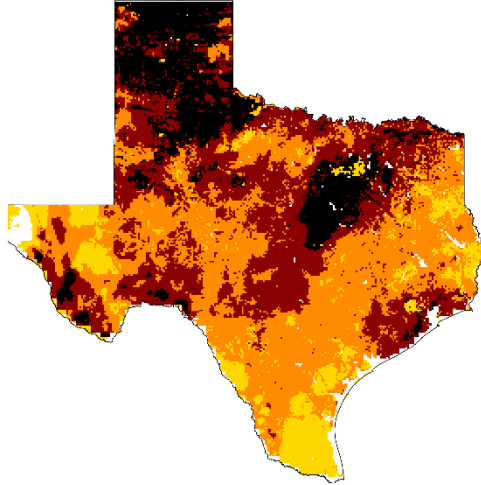


Improvements of Soil Moisture

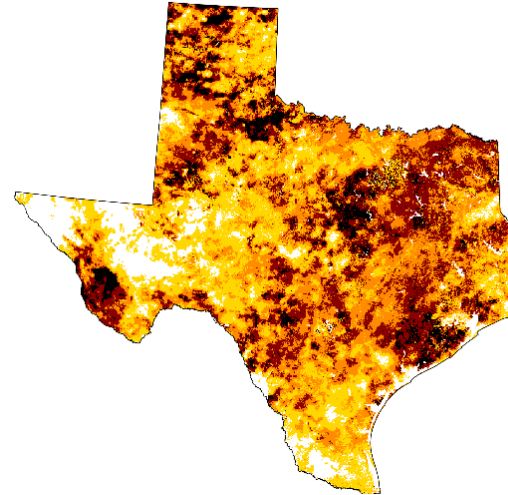
Root(0-100 cm) 2022/JUL/25

2022 Root: Root (SSI and Mean SM)

UTA-LIS

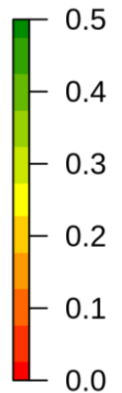
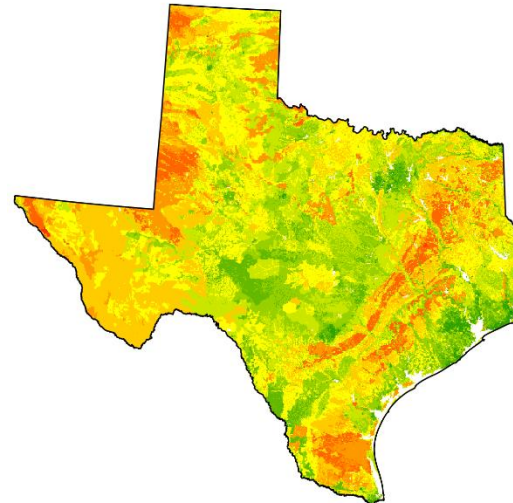
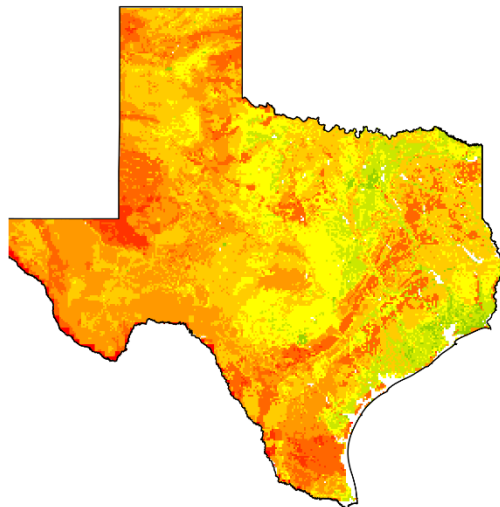


NWM



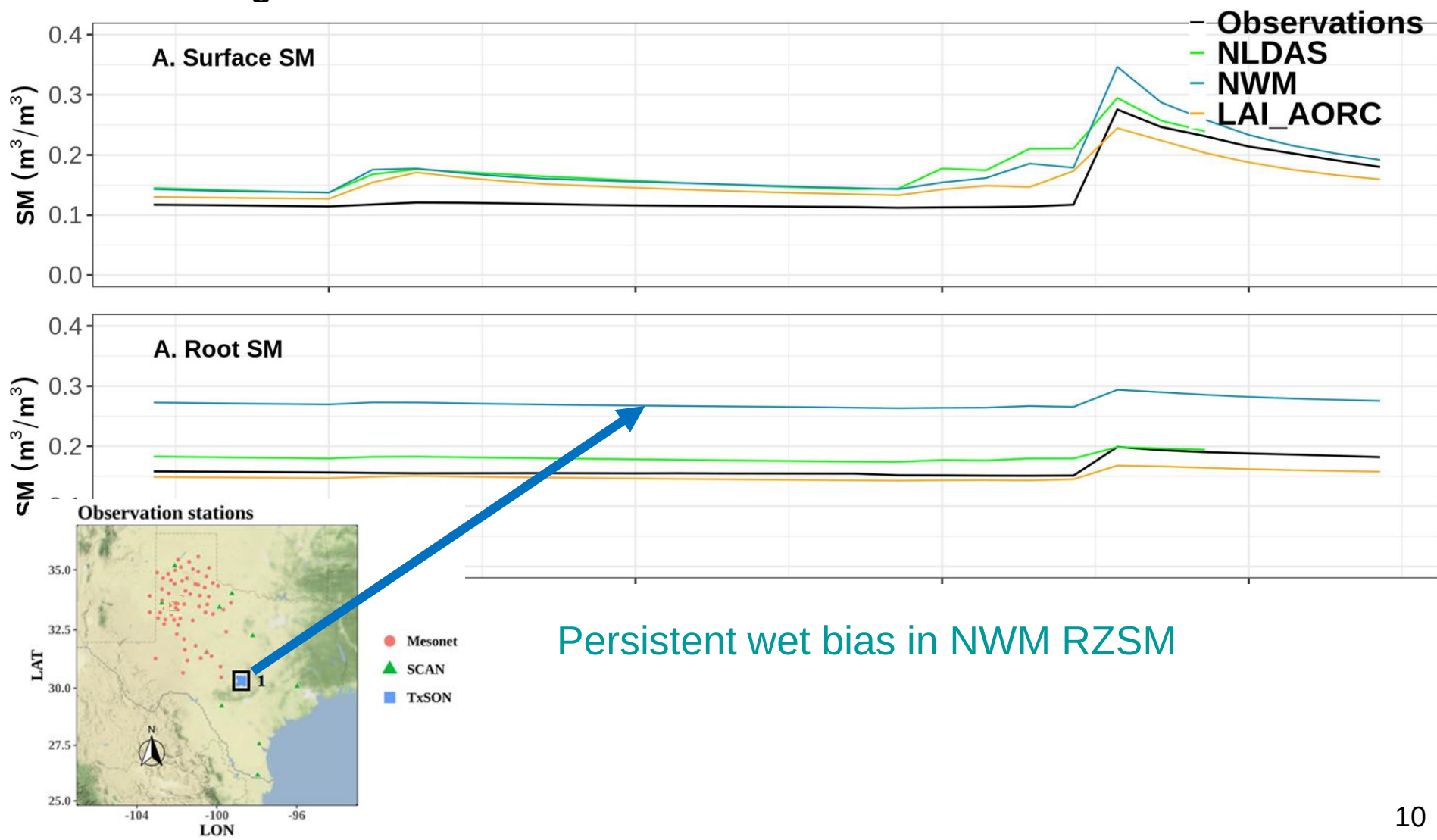
- NO drought
- Mild drought
- Moderate drought
- Severe drought
- Extreme drought

root mean for JUL (40Y)

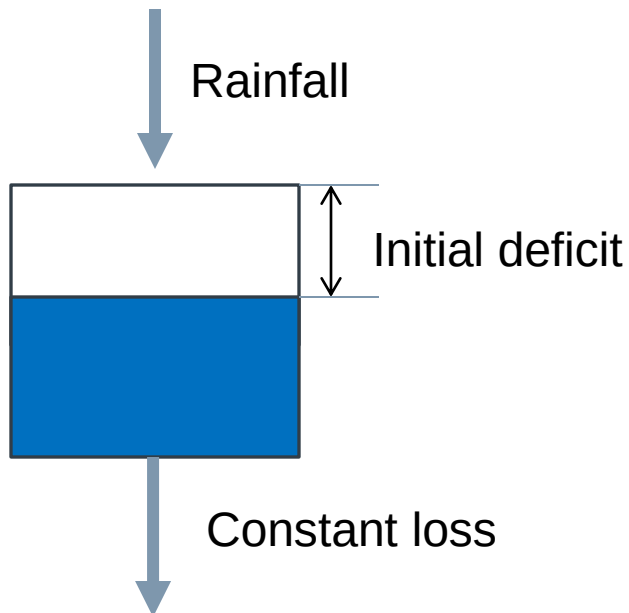


Comparison Against National Products

2022 Drought: Time series



Improved Loss Estimation Scheme

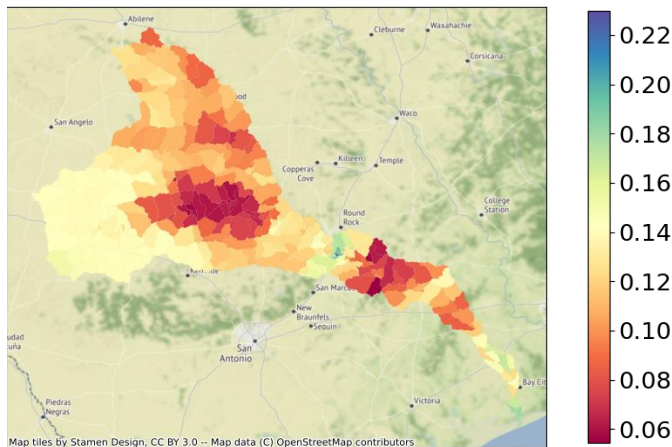


- Total runoff tool (TRT) from WEST
 - Initial deficit derived from soil moisture
 - Constant loss from total precip
 - Not directly applicable to HEC-HMS
 - Uses National Water Model soil moisture

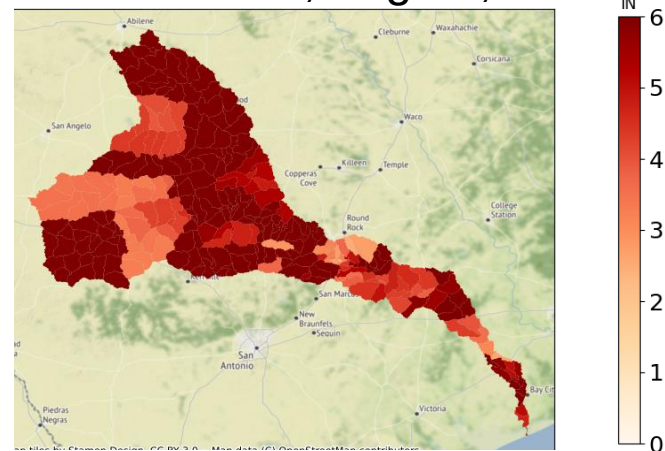
- UTA improvements to TRT
 - deficit/constant loss derived from model calibration
 - Establish relationship between loss and soil moisture
 - Uses UTA-LIS soil moisture

Assisting with Inflow Prediction during Droughts

1-100cm SM, Aug 18, 2022



Initial Deficit, Aug 18, 2022



- UTA-LIS product superior to NWM real-time analysis for western, central Texas

Summary

- Assessing the Relative Impact of Enhanced Precipitation Data versus Improved Vegetation in Representation of Drought
 - ✓ Developing UTA-LIS
 - ✓ Using improved historical precipitation
 - ✓ Improving vegetation phenology
- Creating real-time soil moisture using real-time National Water Model (NWM) forcing

Thank you

- For more information, please contact farhad.hassani@mavs.uta.edu