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**Developing an integrated modeling
framework for Rio Grande Basin Water
Resource Management**

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Introduction

- The aim of this project is to develop a hydrologic modeling framework tailored for the upper and middle Rio Grande Basin for better assessment of surface water availability to assist in efficient decision making of Irrigation Districts

This proposal aims to address two specific water resource management needs identified in the RG Basin assessment:

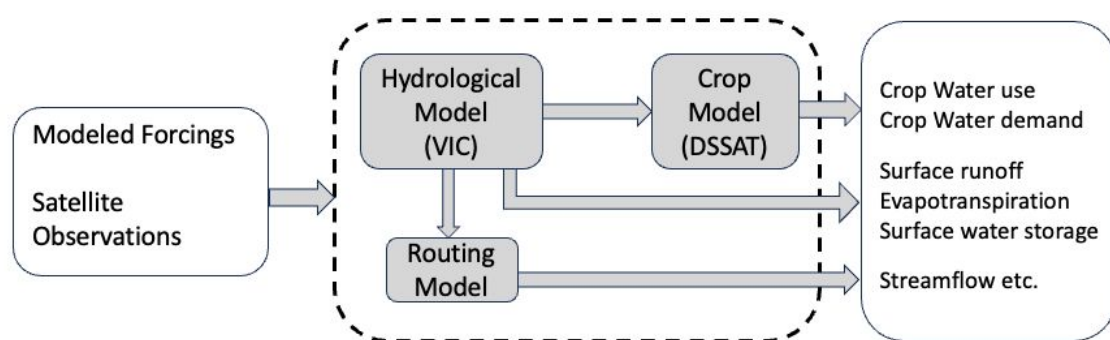
- a) *Integrated Data/Information System and Modeling (4.1.2)*
- b) *Improved water supply forecasts to support planning and farm management (4.2.3)*

The background of the slide features a satellite image of a river basin, likely the Rio Grande, showing winding waterways and surrounding land. The NASA Earth logo is overlaid on the right side of the image.

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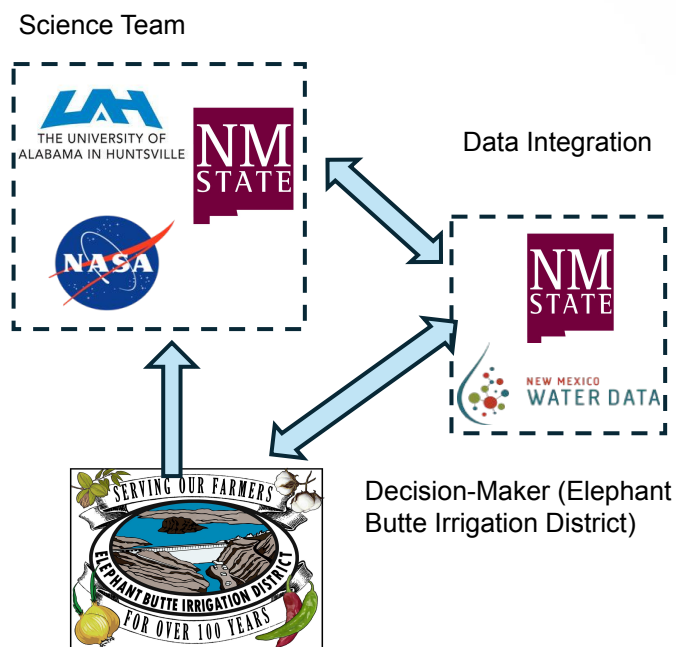
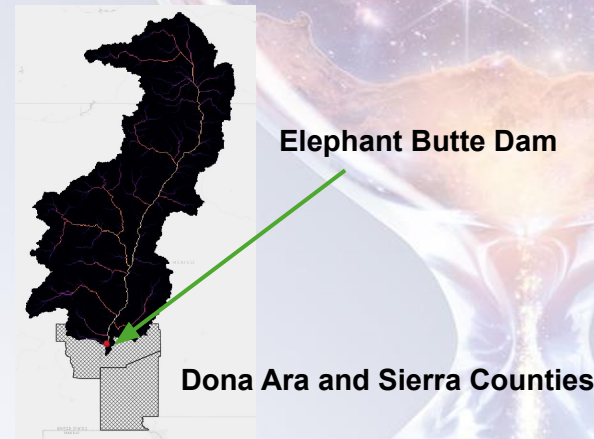
We will use an integrated modeling framework that combines a hydrological and a cropping system model for a comprehensive outlook on the total water availability, agricultural water demand and drought assessments within a watershed.

We are developing a special instance of a global modeling framework called Regional Hydrological Extremes Assessment System (**RHEAS**) tailored for the Rio Grande Basin through various model enhancements as per the needs of the RG Basin and regional partners.



We are using several modeling tools and datasets that are directly or indirectly supported by NASA. RHEAS framework was developed by NASA JPL, additionally we are using multiple model/satellite products to evaluate the mode performance including NASA SPoRT LIS, SMAP, ALEXI ET , OpenET

- **Elephant Butte Irrigation District (EBID)** is the primary Decision-maker partner of this project.
- EBID is responsible for water allocation for two Counties (Dona Ara and Sierra) downstream of Elephant Butte Reservoir on the Rio Grande.



Decision-maker

J. Phillip King Elephant Butte Irrigation District

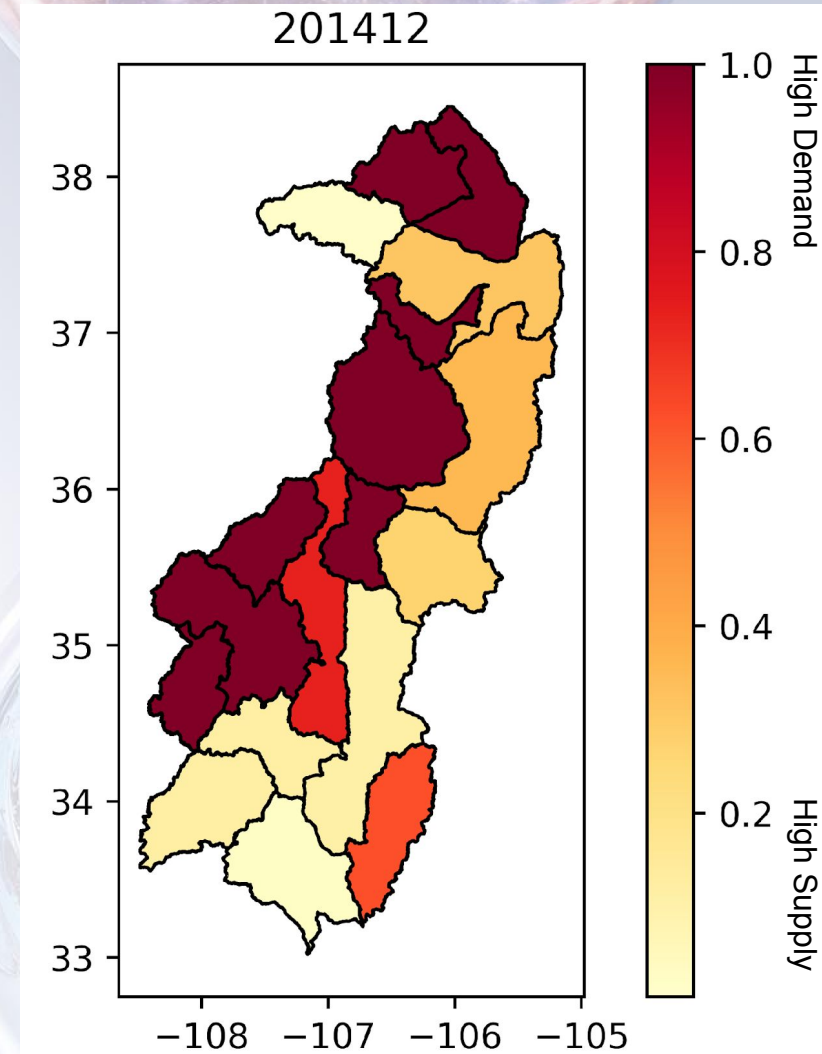
Integration and Data Dissemination Team

Hatim Geli New Mexico State University
Stacy Timmons New Mexico Water Data Institute

Technical Team

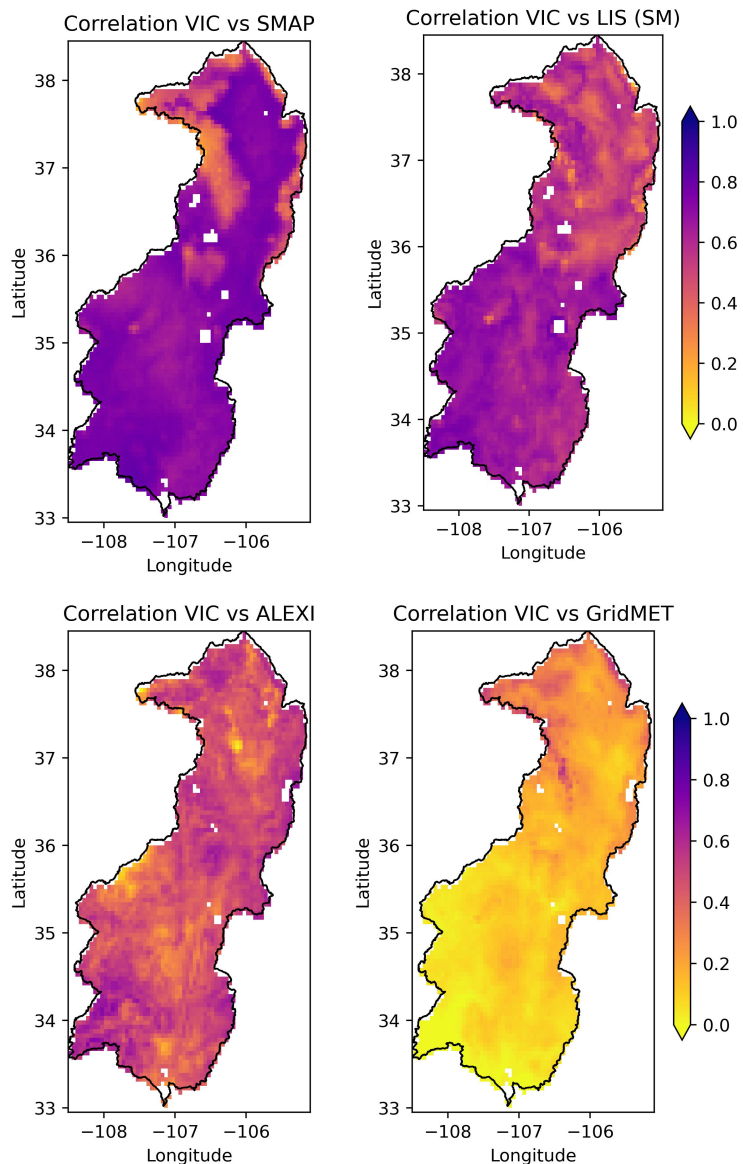
Vikalp Mishra NASA SPoRT | University of Alabama in Huntsville
W. Lee Ellenburg University of Alabama in Huntsville
Venesa Martin University of Alabama in Huntsville
Aditya Jha University of Alabama in Huntsville
Christopher Hain NASA MSFC

- Appropriate allocation of the available water supply among its stakeholders spanning multiple states in the U.S. and Mexico is extremely critical.
- The main goal of this project is to assist EBID in efficient and timely water management decision-making.
- We will deliver a modeling framework that is calibrated for the RG Basin with short-term (15-day) forecasting capabilities.
- EBID is interested in information on current and future water availability
- Therefore, as part of project deliverable, we will provide a 'weekly' outlook on the surface water availability index i.e. a ratio of demand vs supply. This will further assist EBID (and possibly other IDs) in planning their water allocations.



Surface Water Availability Index as computed from WaSSI Model at HUC 8 and monthly scales using default USGS water demand data

Hydrological Model Comparisons:

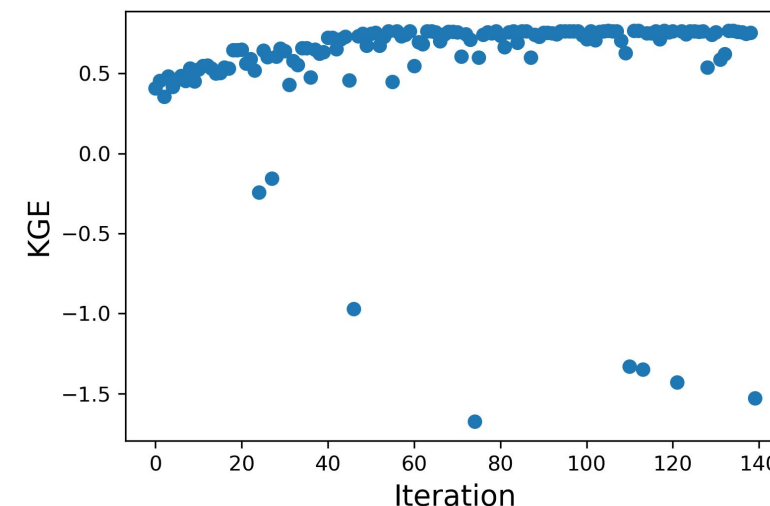
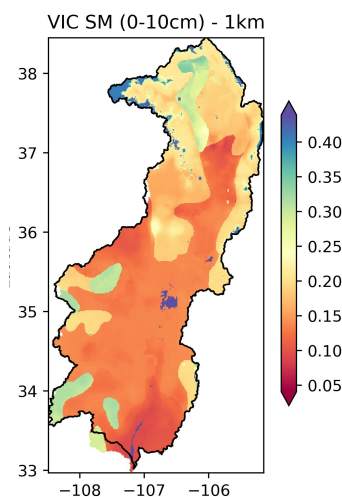


	Bias	RMSD	R
VIC/LIS (SM)	0.05	0.07	0.60
VIC/SMAP	-0.01	0.05	0.68
VIC/ALEXI	2.89	3.15	0.47
VIC/GridMET	5.19	5.76	0.14

- VIC simulations at 5-km Resolution (2000-2023)
- All model evaluations are performed from 2015-2023

Next Steps:

- Enhance the default model resolution from 5 to 1 km by adding high resolution soil and vegetation parameters
- Further calibrate the model to better simulate the streamflow



Streamflow Results

Calibration was performed for site 08289000 (~1100 km²) from 2005-2015
Model evaluation was done from 2015-2023 at same and independent sites.

