

The Western Land Data Assimilation System

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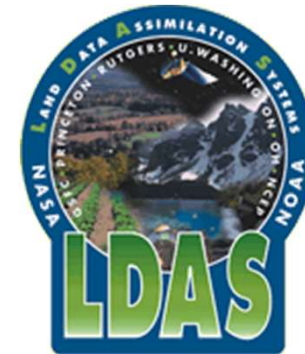
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1. Introduction to the task

Vision	Leverage existing NASA land surface modeling and satellite data assimilation capabilities in a configuration optimized for the western United States (WLDAS)
Objectives	Support decision makers with NASA's best assessment of water availability
Geographic Domain	Latitude: (25.065-52.925°N) Longitude: (124.925-89.025°W)
Project Partner	California State Water Resources Control Board (CA SWRCB)
Decision-Maker(s)	Regional Water Quality Control Boards (RWQCBs) Groundwater Sustainability Agencies (GSAs)
Decision(s) Targeted	Groundwater management, especially in the context of the Sustainable Groundwater Management Act of 2014 Agricultural management

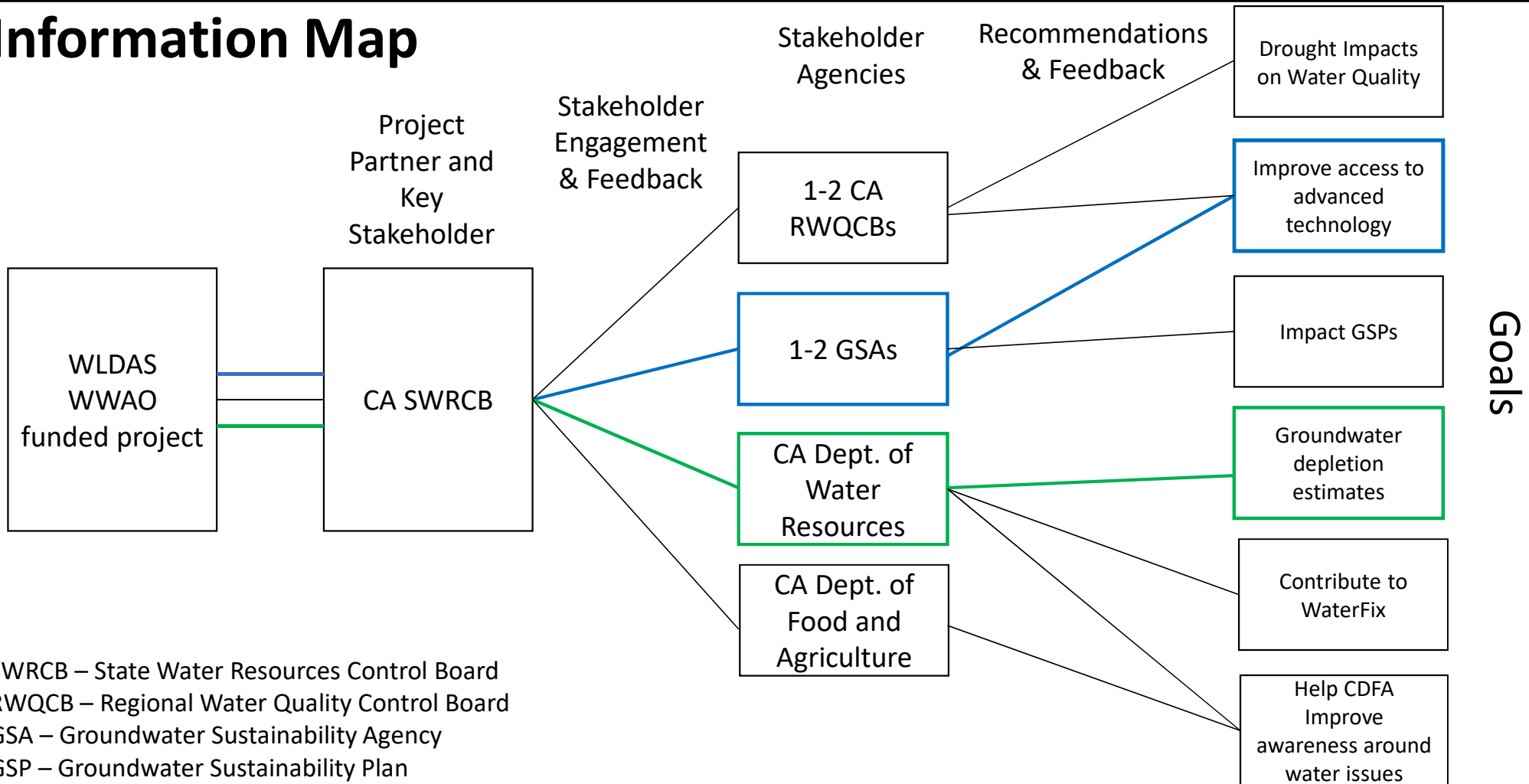


GLDAS
NLDAS
NCA-LDAS
FLDAS



1. Introduction to the task (continued)

Information Map





1. Introduction to the task (continued)

Project Data Requirements

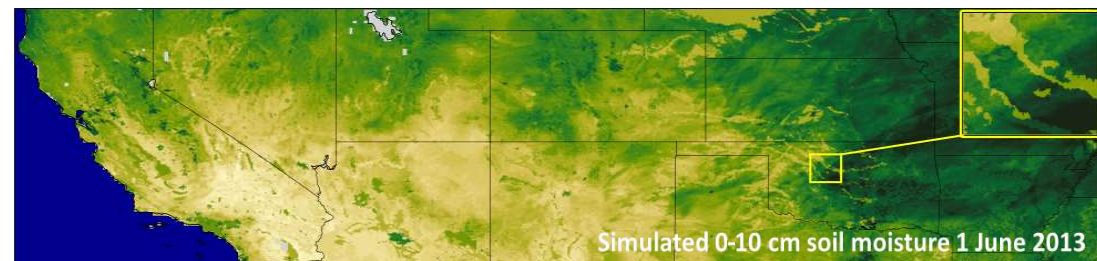
Product*	Format	Desired Accuracy**
Surface Soil Moisture (0-5 cm)	Raster	0.04 m ³ /m ³
Root Zone Soil Moisture (0-100cm)	Raster	0.03 m ³ /m ³
Snow Water Equivalent	Raster	15%
Evapotranspiration	Raster	0.4 mm/day
Runoff	Raster	10 %
Groundwater recharge	Raster	10 mm
Streamflow	Vector	10 %

* Anomaly will be included

** Final determination based upon the Uncertainty Quantification (UQ) study

Product specifications	
Spatial domain	GSA boundary
Spatial resolution	0.01 x 0.01 deg
Latency	1 week***
Temporal frequency	Daily
Format	netCDF/Geotiff (Raster) shape file (Vector)
Product access	Public access at JPL Water Trek
Data stored	JPL Science Data System

*** May be decreased during emergent hydrological events



2. Schedule



Milestone Type	Task	FY18				FY19			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. T/P	Formulation Phase	■	■						
2. T	WLDAS Domain Hindcast (1979-Present) & Configure Sensitivity Exp. (WLDAS v0.0 ^a)		■						
3. T	Internal Evaluation of WLDAS v0.0 ^a runs			■	■				
4. T	Data Assimilation Runs (WLDAS v1.0 ^b)				■	■			
5. T	Sample WLDAS v0.0 ^a Visualizations with Water Trek				■				
6. P	Stakeholder Feedback for Prototype WLDAS v0.0 ^a Products				■				
7. T/P	Transition Plan Development				■				
8. T	Implement WLDAS Configuration Modifications and Conduct Simulations (v0.5 ^c)				■				
9. T/Tr	System testing and WLDAS v0.5^c Deployment				■				
10. T	Internal Evaluation of WLDAS v1.0 ^b Runs				■	■	■		
11. P	Stakeholder Feedback for Prototype WLDAS v1.0 ^b Products						■		
12. T	Implement WLDAS Configuration Modifications and Conduct Simulations (v1.5 ^d)						■	■	■
13. T/Tr	System testing and WLDAS v1.5^d Deployment								■

^a v0.0 = Internal/experimental WLDAS configuration (Open Loop)

^b v1.0 = Internal/experimental WLDAS configuration (DA)

^c v0.5 = WLDAS configuration incorporating stakeholder input (Open Loop)

^d v1.5 = WLDAS configuration incorporating stakeholder input (DA)

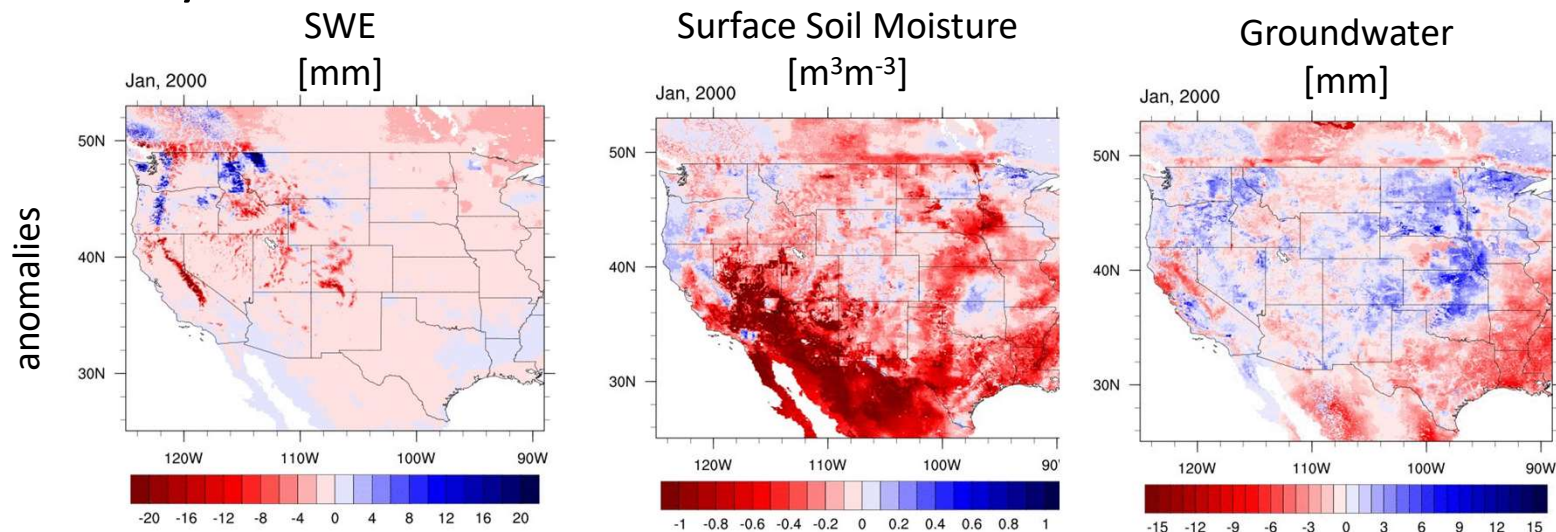
Milestones Key: T (technical) P (partner or stakeholder) Tr (transition)

Deliverables in **bold**

Key Accomplishment Highlight - Technical



- Climatological run completed with NLDAS-2 forcing (1979-2017)
 - Sensitivity studies of precipitation forcing, configuration of soil layers, vegetation parameterization
- Incorporation of Multi-Radar Multi-Sensor Precipitation (2010-2017)
- Evaluation of model with *in situ* and remotely sensed observations underway



Key Accomplishment Highlight - Stakeholder

- Introduction to the nine Regional Water Quality Control Boards (25 October 2017)
- Letter of support from chair of CA SWRCB (12 January 2018)
- Discussion with climate and groundwater staff of CA SWRCB (16 February 2018)
- Visit to CA SWRCB and CA Department of Water Resources (27 February 2018)
- Potential end users identified in Colorado and Oklahoma
 - Lower Colorado River Authority has expressed interest in WLDAS

Key Accomplishment Highlight - Transition



- Transition Discussion
 - Focus on computing requirements, technical support, and product formats for final system
 - 38-year archive (full WLDAS domain): ~10 TB
- Future Transition Plans
 - Proposed workshops with 1-2 pilot GSAs
 - Product evaluations with end users
 - Training documentation

Supplemental: Outcomes and Metrics



- Provide list of specific outcomes achieved during course of project and relevant metrics relevant to the outcome.

Supplementary Info on Progress



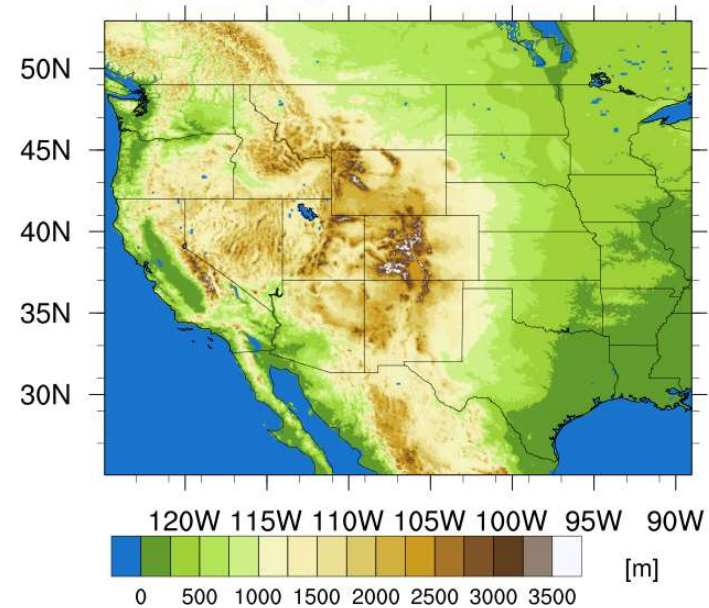
• Model Configuration

- Land surface model: Noah-MP
- Domain: Latitude: 25.065-52.925°N
Longitude: 124.925-89.025°W
- Soil Layers: 11 layers (Two 10 cm layers;
Nine 20 cm layers)
- Land cover: MODIS
- Soil texture: 1 km STATSGO-FAO
- Elevation: SRTM
- Greenness fraction: MODIS/NOAA-NCEP
- Albedo: MODIS/NOAA-NCEP
- Forcing data: NLDAS-2; MRMS Blend (when available)

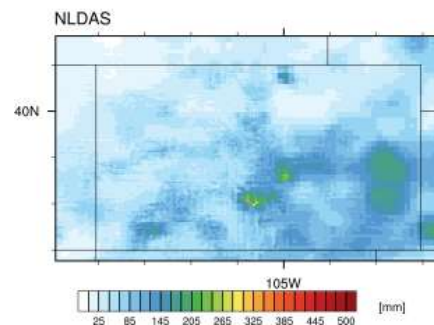
• Downscaling Methods

- Precipitation: 1 km hybrid PRISM/WorldClim climatology
- Shortwave radiation: Slope-aspect ratio correction
- Other fields: Lapse rate correction

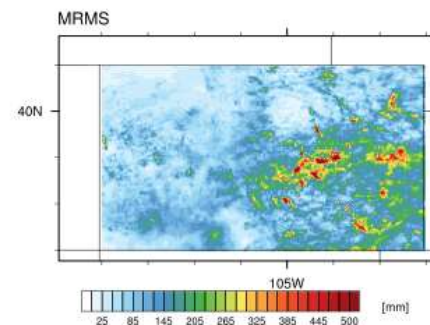
Domain Elevation



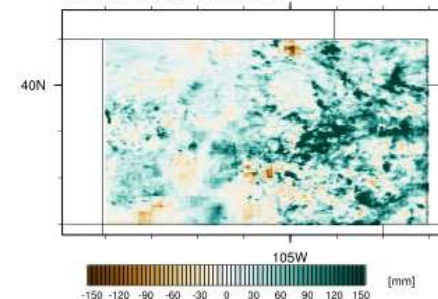
Precipitation Forcing
July 2017



Total Rainfall



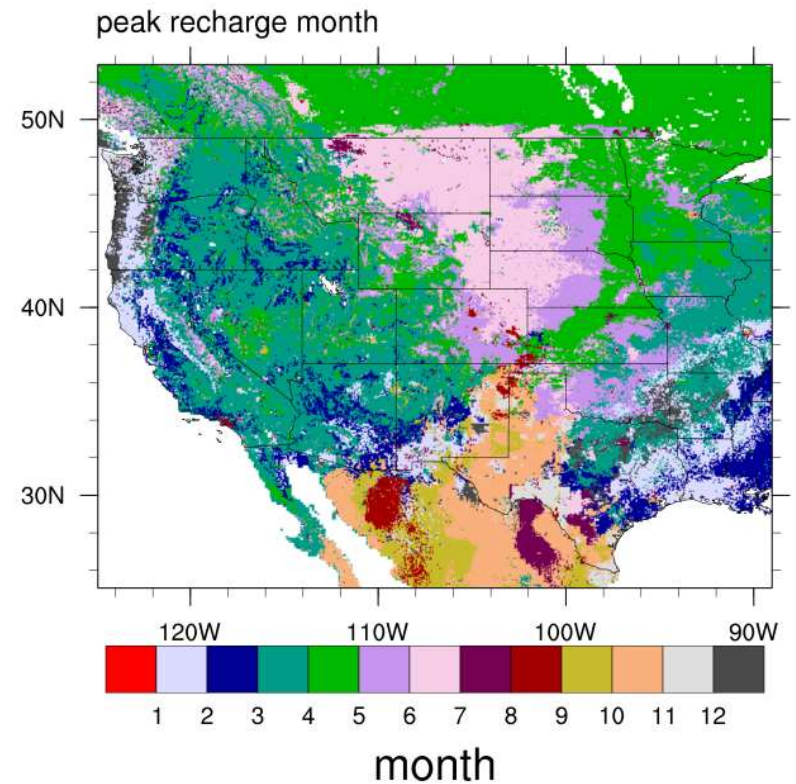
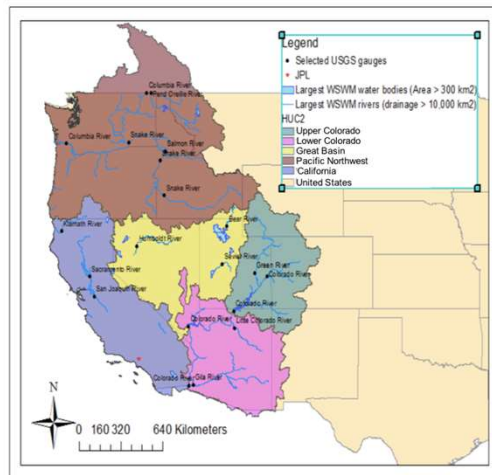
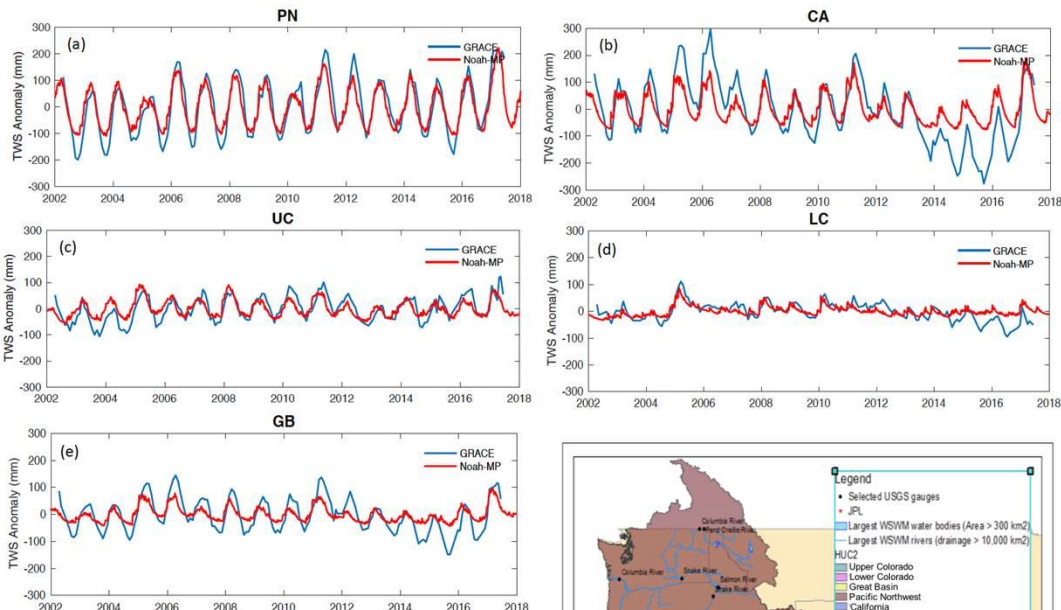
Difference (MRMS-NLDAS2)





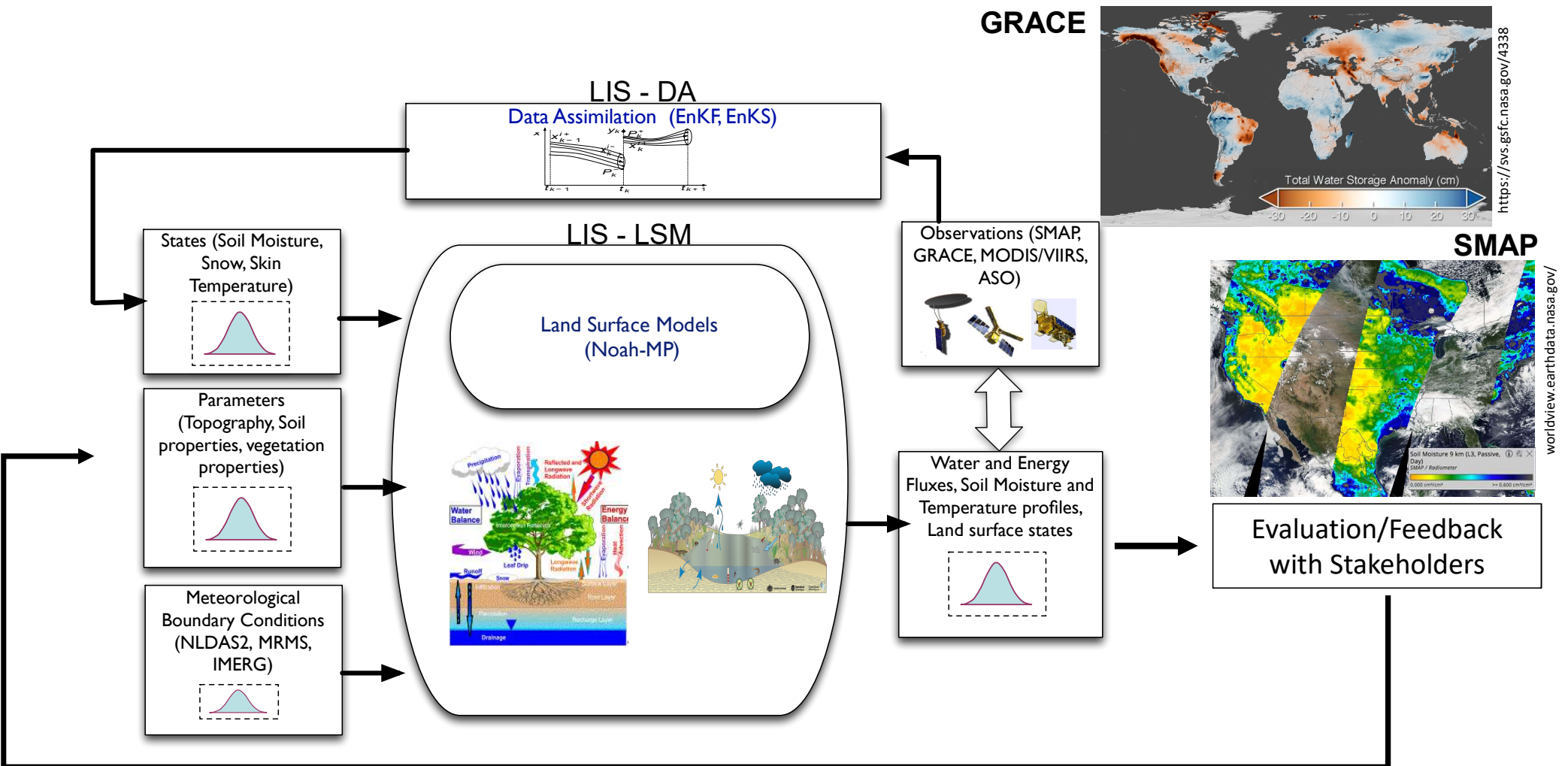
Supplementary Info on Progress

Model Evaluation



Modeled Terrestrial
Water Storage Anomaly
vs.
GRACE

Product Generation Process



Team Members

