Jay Famiglietti

Senior Water Scientist
California Institute of Technology
Jet Propulsion Laboratory

Board Member, LARWQCB (Region 4)

**Observing Hydrology and Climate Change from Space**
Questions:

Can we use NASA satellite and airborne data and other expertise to address climate change?
Can we help the SWRCB and the regional boards?
Some Current and Future NASA JPL Satellite and Aircraft Water Missions

GRACE (2002-2017)
GRACE-FO (2018)

ASO (2013)

SWOT (2021)

SMAP (2015)

Plus NISAR, GPS, etc
Potential Utility of NASA Airborne and Satellite Assets

Observation/estimation of:

- Precipitation and tracking atmospheric rivers
- Snow cover and snow water equivalent
- Surface water storage in reservoirs, lakes and large rivers
- Surface soil moisture content
- Groundwater storage changes
- Evapotranspiration and fallowed land
- River discharge
- Subsidence
- Flooding and drought
Changing freshwater availability in the United States from GRACE (2002-2016)
Changing freshwater availability from GRACE (2002-2016) - Reager et al., 2016
Changes in Total Water Storage in the Sacramento-San Joaquin-Tulare Lake Basins, 2002-2017

(a) Total Water Storage

(b) Snow Water Equivalent

(c) Surface Water Storage

(d) Soil Moisture
Cumulative Groundwater Losses in California’s Central Valley Since 1962
Integrated models enable new science and applications

*Can we help CA water managers define ‘sustainable’ groundwater use?*

Massoud et al., 2017, in revision
Groundwater Induced Land Subsidence

Like deflation of a tire
Only occurs where clay minerals exist
Currently experiencing fastest rates ever
Damage to infrastructure: roads, bridges, canals
Snow Water Equivalent
Tuolumne Basin
Aug 16, 2017
WWAO – NASA’s Western Water Applications Office
A local western office helping to inform water decisions with NASA data

What is the WWAO?
• A new initiative from NASA’s Earth Science Division, Applied Sciences Program to support Western US water management to put NASA data to work in making decisions.

What does the WWAO do?
• Connect stakeholders with NASA scientists, technology, tools, and data.
• Develop strategic solutions through applications projects.
• Assist application transition into operational state.

Why the NASA-WWAO?
• Apply NASA’s wealth of science, remote sensing data and expertise.
• Leverage decades of investment in science and technology.
• Develop and maintain lasting relationships with stakeholders.
Characterizing California Drought with GRACE and Total Water Storage Deficit

TWS Anomalies (CU. km)

Water Storage Deficit (CU. km)

-100
-50
0
50
100


Drought begins
Drought peak and magnitude
Drought ends