

NASA Science Mission Directorate

Earth Science Division

Applied Sciences Program



Water Resources Applications Area

Bradley Doorn

*WSWC Meeting, St. George, UT
29 Sep 2016*



Water Resources Applied Research



The Water Resources program addresses concerns and decision processes that are related to water availability, water forecasts, and water quality. The goal of the Water Resources theme is to apply NASA satellite data to improve the Decision Support Tools (DSTs) of user groups that manage water resources. The Water Resources theme partners with Federal agencies, academia, private firms, and international organizations.

RECENT SOLICITATIONS

- ROSES 2011 – Drought
 - ✓ 9 Projects (\$9M over 3 years)
- ROSES 2013 – In-Season Forecasting of Water Resource Anomalies
 - ✓ 9 Projects (\$12M over 4 years)
- ROSES 2016 – Water Quality and Agriculture Water Use
 - ✓ Awards expected Dec 2016 (\$9M over 3 years)

Examples of Water Resources Projects

PARTNER	APPLIED WATER INFO
State of California	Ag Water Use
Colorado Basin River Forecast Ctr	Snow Water Equivalent
US Drought Monitor	Ground Water Estimates
USDA	Soil Moisture Indicators
G20 Ag Ministers	Crop Yield Monitoring
Raleigh, NYC, and Denver	Water Quality Indicators
NOAA-NESDIS	Flash Drought Triggers
USDA, US Foreign Services	Global Reservoir Hts.



NASA Satellite Irrigation Management Support: Mapping Crop Water Requirements to Assist Growers in Optimizing Water Use



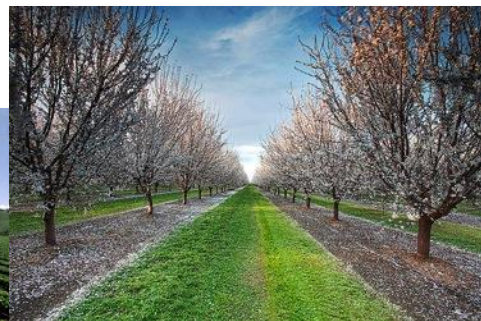
PROJECT TEAM: NASA Ames Research Center, California Dept. of Water Resources, Western Growers Association, California State University, Univ. of California Cooperative Extension, Desert Research Institute, USDA Ag. Research Service, USGS, Booth Ranches, Chiquita, Constellation Wines, Del Monte Produce, Dole, E & J. Gallo, Farming D, Fresh Express, Pereira Farms, Ryan Palm Farms



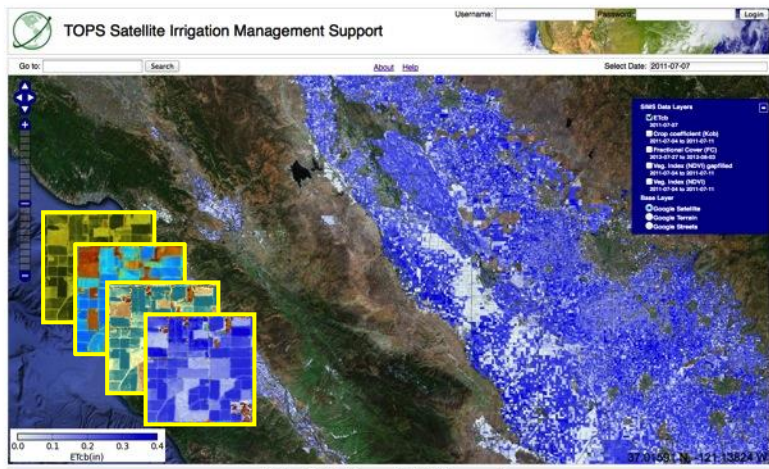
Terra Satellite



Landsat 8



California agricultural sector produced \$46.4b In 2013



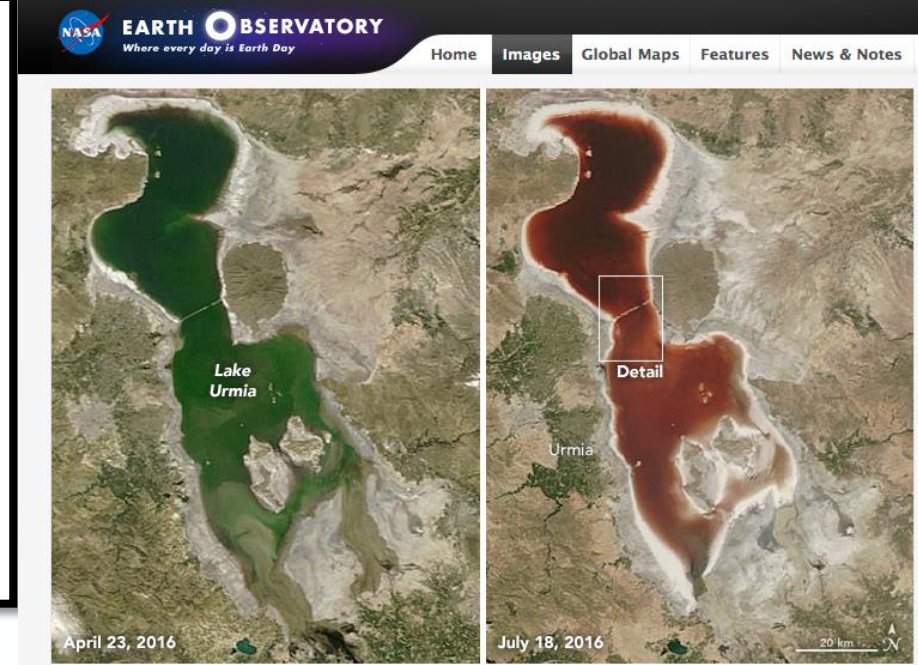
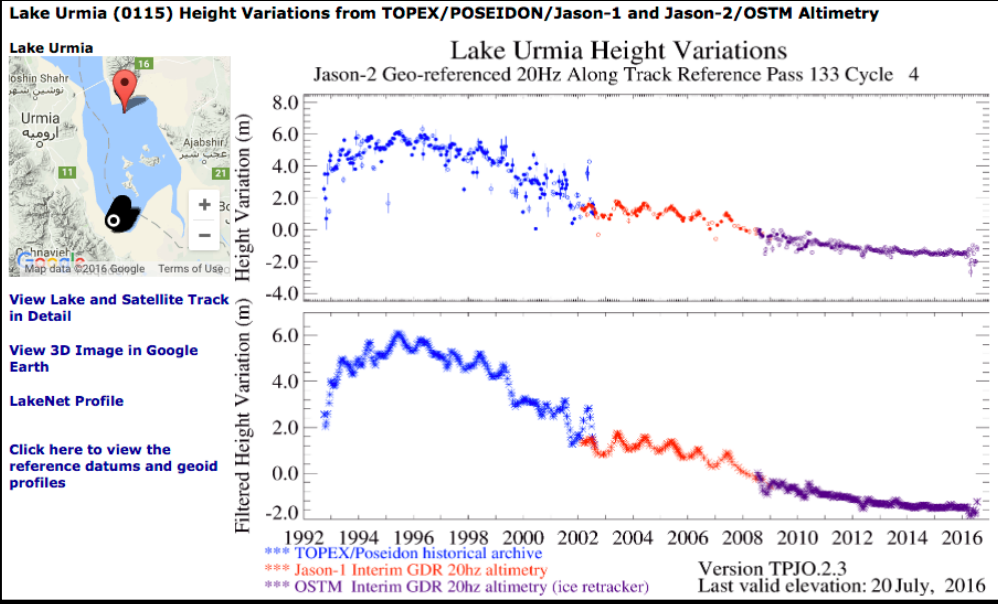
NASA SIMS web and mobile data services puts irrigation demand across 8 million acres of farm land directly into the hands of farmers and water managers



Students work hand in hand with growers to validate the system and quantify benefits

For more information, contact forrest.s.melton@nasa.gov, or visit <https://c3.nasa.gov/water/projects/1/>

Lake Heights and Water Quality



Lake Heights from Radar Altimetry (Lake Urmia, NW Iran)

G-Realm Project, Charon Birkett, University of Maryland

MODIS (UR images) and Landsat 8 (LR images) to detect water quality changes.
Red coloration due to microorganisms (algae or bacteria) changing color due to lack of fresh water inflows.

NASA Earth Observatory Article: dtd 26 Jul 2016
http://earthobservatory.nasa.gov/IOTD/view.php?id=88395&eocn=home&eoci=iotd_previous



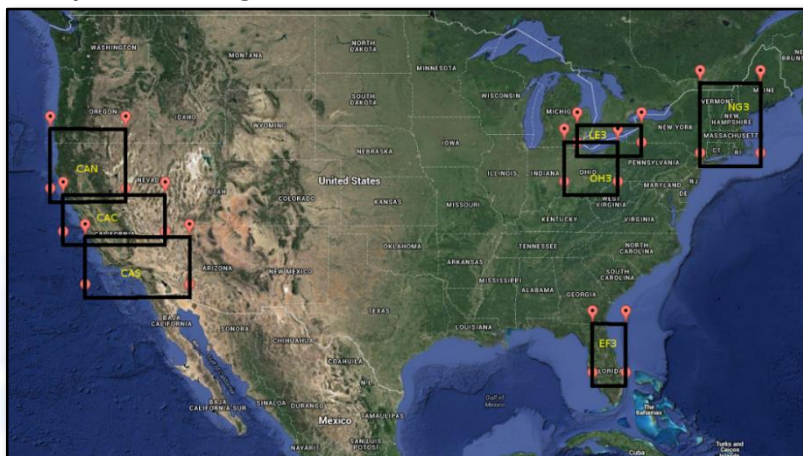
Water Quality – CyAN (cYanobacteria Assessment Network)



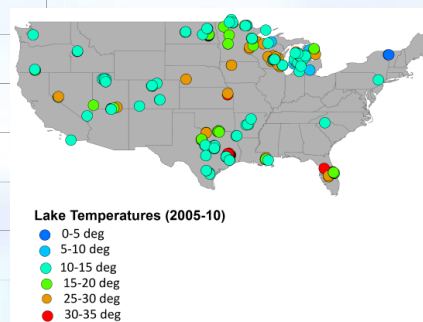
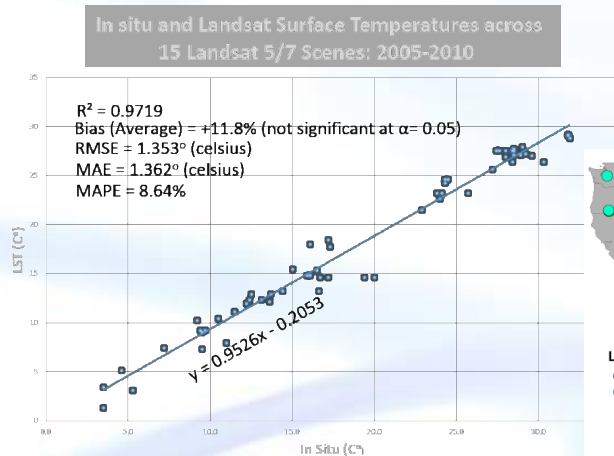
Objective: Support the environmental management and public use of U.S. lakes and estuaries by providing a capability of detecting and quantifying algal blooms and related water quality using satellite data records.

Approach

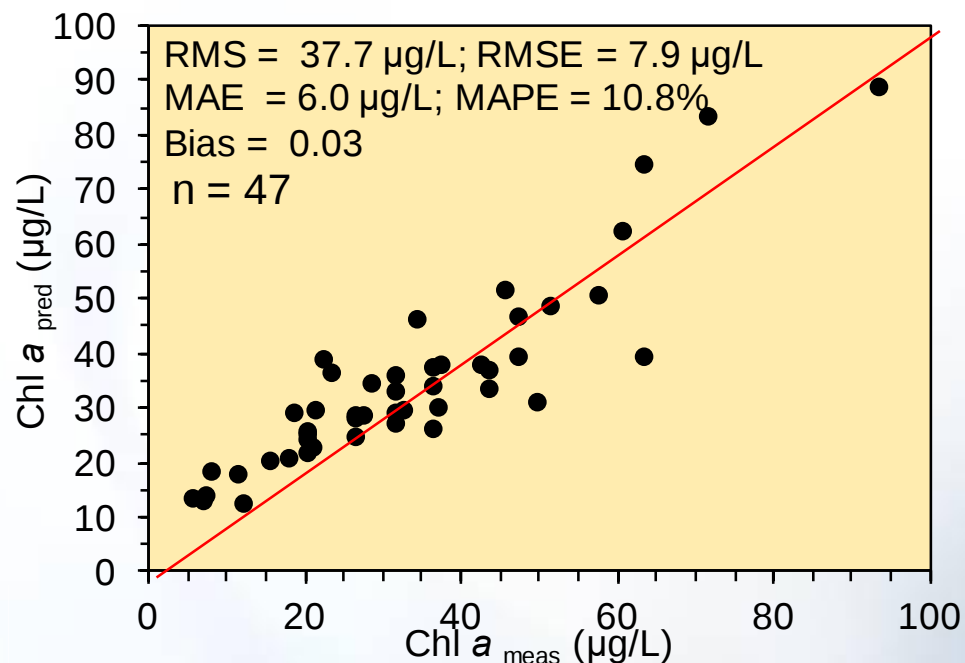
- Preliminary versions of NOAA cyanobacteria algorithms implemented into NASA standard processing software.



- Initial validation of Landsat 5/7 surface water temperature.



- 3 band reflectance model derived from USGS Landsat 7 & 8 surface reflectance products to predict chlorophyll (chl a) concentrations in lakes and ponds.



Earth Science Missions and Instruments

- Formulation
- Implementation
- Primary Ops
- Extended Ops

Altimetry-FO (Formulation in FY16; Sentinel-6/Jason-CS)

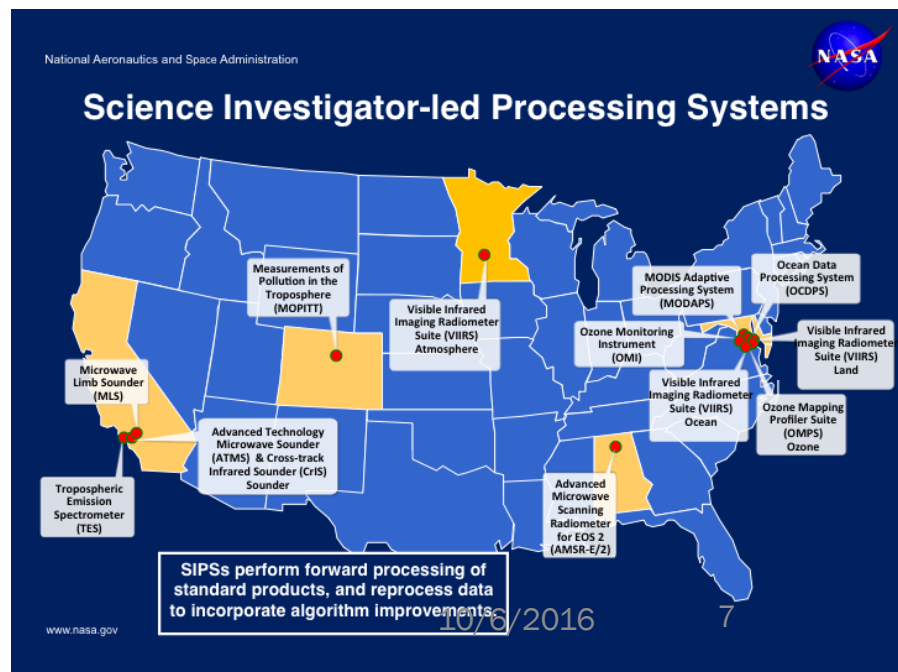
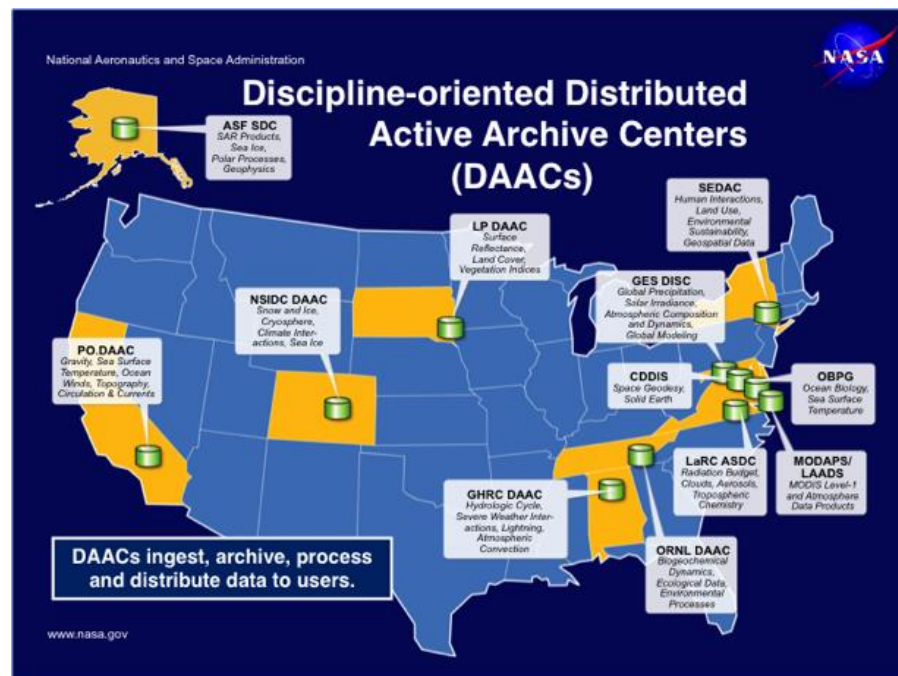
Earth Science Instruments on ISS:

RapidScat, CATS,
LIS, SAGE III (on ISS), TSIS-1, OCO-3,
ECOSTRESS, GEDI,
CLARREO-PF



NASA'S EOSDIS

- Earth Science Data are held at Distributed Active Archive Centers (DAACs) to provide **knowledgeable curation** and **science-discipline-based support**
- NASA provides **high bandwidth** network connectivity to support production data flows and community access to data, including access to **Near Real Time data**
- NASA develop tools for users to obtain **needed** data/information while minimizing burden associated with unwanted data
- NASA engages with multiple US agency efforts to facilitate **use of data by broadest possible community** with minimal effort and maximal consistency with other data sources



- Western Federal Advisory Support Team (WestFAST)
 - WestFAST is a collaboration between 12 Federal agencies with water management responsibilities in the West. WestFAST was established to support the Western States Water Council (WSWC) and the Western Governors Association in coordinating Federal efforts regarding water resources.
- Active Memorandum of Agreements/Understandings related to water research with
 - USAID
 - USDA
 - EPA
 - NGA (Pending)

New NASA Applied Research Initiatives

(all with water-cycle information needs)



- **Western Water Application Office**

- ✓ The **National Aeronautics and Space Administration (NASA)** announced at the 2016 White House Water Summit the formation of a new, agency-wide Western Water Applications Office (WWAO), based at the Jet Propulsion Laboratory (JPL). The WWAO will support the strategic development of key applications from satellite observations and airborne technologies to maximize their use in order to better meet the challenges of drought, flooding, declining snowpacks, and falling groundwater levels across the west.

- **Planned**

- **Global Food Security Program**

- Based at GSFC
- Kick-off CY2017

- **Disasters Program**

- CY2018

**NASA Science Mission Directorate
Earth Science Division
Applied Sciences Program**



QUESTIONS

Water Resources Applications Area

Bradley Doorn

29 Sep 2016

