



2015 Water Resources Applications Program Review



NASA Water Resources Program Update



CHRIS HAIN AND JOHN BOLTEN
ALONG WITH OUR HOST, NOAA

THANKS!

The WR Team



- Forrest Melton, Associate PM
- John Bolten, Associate PM
- Christine Lee, Associate PM (International Programs)
- Nancy Searby, International Programs, DEVELOP, Training
- Jared Entin, Terrestrial Hydrology PM
- Dave Toll – International Water Support
- Larry Liou – USGEO Water Quality Component Lead

- David Green – Disasters PM
- John Haynes – Health/Air Quality PM
- Woody Turner – Ecosystem Forecasting PM
- Lucien Cox – Operations Manager
- Lawrence Friedl – ASP Director

The Applied Sciences Program funds projects that enable uses of NASA Earth science data in organizations' policy, business, and management decisions.

Applications Areas

The program focuses on economic, health, resource management, and other themes to discover and demonstrate applications targeted at integrating Earth observations in specific decision-making activities. Projects with public and private organizations.

- *Applications Projects*
- *Feasibility Studies*
- *Applied Research Teams*
- *Mission Planning Support*

Capacity Building

The program sponsors specific activities to build skills, users, and capabilities in the US and developing countries on how to access and apply environmental satellite data to benefit society.

- *SERVIR*
- *DEVELOP & Workforce development*
- *Gulf of Mexico Initiative*
- *Training Modules*

The Applied Sciences Program funds projects that enable uses of NASA Earth science data in organizations' policy, business, and management decisions.

Applications Areas

The program focuses on economic, health, resource management, and

*Proving-Out Applications:
Demonstration of
Applications Ideas,
Realization of
Socioeconomic Benefits,
and Transitions*

- *Feasibility Studies*
- *Applied Research Teams*
- *Mission Planning Support*

Capacity Building

The program sponsors specific activities to build skills, users, and

*Building Customers:
Creating Opportunities
for New Users &
Organizations to be
Aware and Able to Use
Earth Science*

- *Gulf of Mexico Initiative*
- *Training Modules*

Emphasis in four Applications Areas



**Health &
Air Quality**



**Water
Resources**



Disasters



**Ecological
Forecasting**

Formal Applications programs in these areas

Clear, definite goals and investment plans

Distinct Program Manager & Associates

Generating significant applications and transitions as well as in-depth partnerships

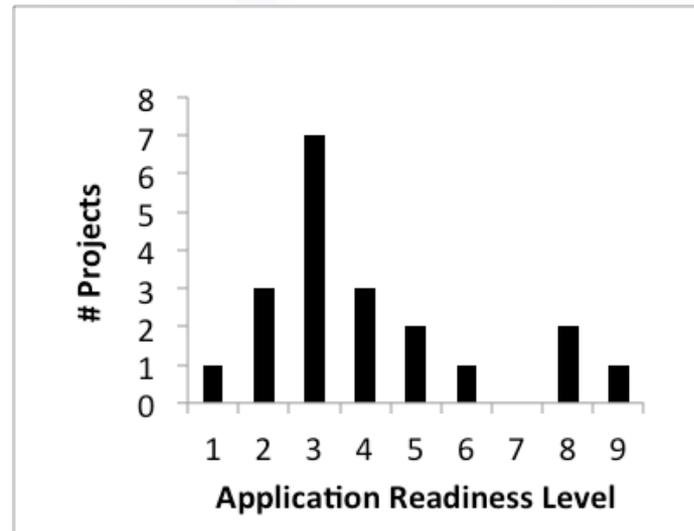
Applications that Capacity Building elements can draw on

Water Resources (a few highlights): 2014 Annual Summary (Input to ASP Annual Report)



- A45 Solicitation
- Expanded USAID Partnership (PEER-Water)
- Water Quality Workshops (GRC)
- CADWR – NASA Joint Workshop
- WSWC – NASA Joint Workshop (JPL)
- Of 20 Active Projects-Nicely distributed ARL's

Water Resources Projects	
ARL	# Projects
9	1
8	2
7	
6	1
5	2
4	3
3	7
2	3
1	1
Total	20



NASA Water Resource Applied Sciences



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NASA Applied Sciences Program Water Resources

Earth Science Serving Society

The goal of the ASP Water Resources application area is to apply NASA satellite data to improve the decision support systems of organizations and user groups that manage water resources. The ASP Water Resources application area partners with Federal agencies, academia, private firms, and international organizations.

[LEARN MORE](#)



<https://c3.nasa.gov/water/>

**Welcome to the NASA Applied Sciences Program
Water Resources Application Area**

ROSES 2011 & 2013 NASA Water Resources Projects

PI	Title	PI Org.	Associate PM	Solicitation
AGHAKOUCHAK	Advancing Drought Onset Detection and Seasonal Prediction Using a Composite of NASA Model and Satellite Data	UCI	Melton	ROSES 2013 – WR Anomaly Outlook
BOLTEN	Enhancing the USDA Global Crop Production Decision Support System with NASA Soil Moisture Active Passive (SMAP) Satellite Observations	NASA/GSF C	Lee	ROSES 2013 – WR Anomaly Outlook
DAY	Advancing Water Supply Forecasts in the Colorado River Basin for Improved Decision Making	Riverside Tech. Inc.	Melton	ROSES 2013 – WR Anomaly Outlook
GEBREMICHAEL	Optimizing Reservoir Operations for Hydropower Production in Africa through the use of Remote Sensing Data and Seasonal Climate Forecasts	UCLA	Lee	ROSES 2013 – WR Anomaly Outlook
HOSSAIN	Towards Operational Water Resources Management in South Asia Exploiting Satellite Geodetic and Remote Sensing Technologies	UW	Lee	ROSES 2013 – WR Anomaly Outlook
JACOBS	Satellite Enhanced Snowmelt Flood Predictions in the Red River of the North Basin	UNH	Bolten	ROSES 2013 – WR Anomaly Outlook
PETERS-LIDARD	Predicting Middle Eastern and African Seasonal Water Deficits using NASA Data and Models	NASA/GSF C	Bolten/Lee	ROSES 2013 – WR Anomaly Outlook
RODELL	Integrating GRACE and GRACE Follow On Data into Flood and Drought Forecasts for the Continental U.S.	NASA/GSF C	Bolten	ROSES 2013 – WR Anomaly Outlook
STANFORD	Decision Support System (DSS) to Enhance Source Water Quality Modeling and Monitoring using Remote Sensing Data	Hazen – Sawyer, P.C.	Lee	ROSES 2013 – WR Anomaly Outlook
BIRKETT	The Global Reservoir and Lake Monitor (GRLM): Expansion and Enhancement of Water Height Products.	UMD	Bolten	ROSES 2013 – Drought
DOZIER	Assessing Water Resources in Remote, Sparsely Gauged, Snow-Dominated Mountain Basins	UCSB	Melton	ROSES 2013 – Drought
HAIN	Development of a Mult-Scale Remote Sensing Based Framework for Mapping Drought over North America	NOAA	Melton	ROSES 2013 – Drought
BECKER-RESHEF	Global monitoring of agricultural drought: A contribution to GEO GLAM	UMD	Bolten	ROSES 2013 – Drought
MELTON	Mitigation of Drought Impacts on Agriculture through Satellite Irrigation Monitoring and Management Support	NASA/ARC	Bolten	ROSES 2013 – Drought
PAINTER	Integration of precision NASA snow products with the operations of the Colorado Basin River Forecast Center to improve decision making under drought conditions	NASA/JPL	Melton	ROSES 2013 – Drought
ROSENZWEIG	Adaptation Planning for Climate Change Impacts using Advanced Decision Support and Remote Sensing: Irrigated Agriculture in California's Central Valley	NASA/GSF C	Melton	ROSES 2013 – Drought
VERDIN	Fallowed Area Mapping for Drought Impact Reporting and Decision Making	USGS	Melton	ROSES 2013 – Drought
WARDLOW	The Quick Drought Response Index (QuickDRI): An Integrated Approach for Rapid Response Agricultural Drought Monitoring	UNL	Melton	ROSES 2013 – Drought

Upcoming Water Resources Applied Research Activities



- GEOGLAM – AgMIP Workshop
 - 11-12 March 2015
 - Beltsville, MD (USDA-ARS)
- SMAP Impact Workshop
 - 11-12 March 2015
 - Washington, D.C.
- Western States Water Council/WestFAST Principles Meeting
 - 17 March 2015
 - Washington D.C.
- USDA and EPA MOU's (expected signing Spring 2015)
- USGEO Workshop
 - Present/discuss USGEO Water Strategy
 - 16 - 17 April
 - Alexandria, VA

Upcoming Water Resources Applied Research Activities (cont.)



- 4th NASA Carbon Cycle & Ecosystems Joint Science Workshop (JSW4)
 - 20-24 April 2015
 - UMD Conference Center
- AMS Policy Forum
 - Theme: APPLIED DECISION SUPPORT: MEETING USER NEEDS
 - 21 – 23 April
 - Washington, DC
- Scoping (formulation phase in NASA-speak) of Snow Water and Food Security Centers
 - FY16, FY17 implementations
- Solicitation NET Spring 2016

International Water Program Updates



HQ: Brad Doorn, Nancy Searby, Jared Entin

Program Team: Dave Toll, Forrest Melton, John Bolten, Rick Lawford, Christine Lee, Ted Engman

World Water Forum (S. Korea, April 2015)

- High level water community meeting, occurs every three years
- Planned participation includes coordination with DoS, USWP, possibly USACE – may include – EO S&T session, US Pavilion booth and presentation, plenary talks, potential side event proposal

PEER (pre-proposal submission closed Jan 9, 2015)

- Joint activity with USAID to support international partnerships
- Focus on water nexus and SERVIR activities
- Nearly 60 pre-proposal submissions, with partners across R&A programs and ASP

US GEO Water Strategy (target June 2015 for near-finalized version)

- GEO Global Water Sustainability (GEO GLoWS) Strategy outline has received inputs from 4 out of 5 component areas under Water task
- Under revision and to be distributed to other agency partners for feedback



Land Imaging (Landsat and Beyond)

FY14 President's NASA budget featured a new land imaging project for development of a national sustained Land Imaging Satellite System (with USGS).

Basic study tenets for the program

- » *Sustainability*: Provide data products for the long haul within the budget guidance provided.
- » *Continuity*: Continue the long-term Landsat data record; focus is on usable products that define the utility of the data record.
- » *Reliability*: Exhibit a form of functional redundancy.
Data sets should be able to draw on equivalent or “near equivalent” deliverables from different sources to provide the data for the highest priority land imaging data products; loss of a single satellite or instrument on orbit should not cripple the program or significantly impact users.

2016 NASA Budget Summary



Earth Science

Outlays are notional

(\$M)	2016	2017	2018	2019	2020
Earth Science	\$1,947	\$1,967	\$1,988	\$2,009	\$2,027

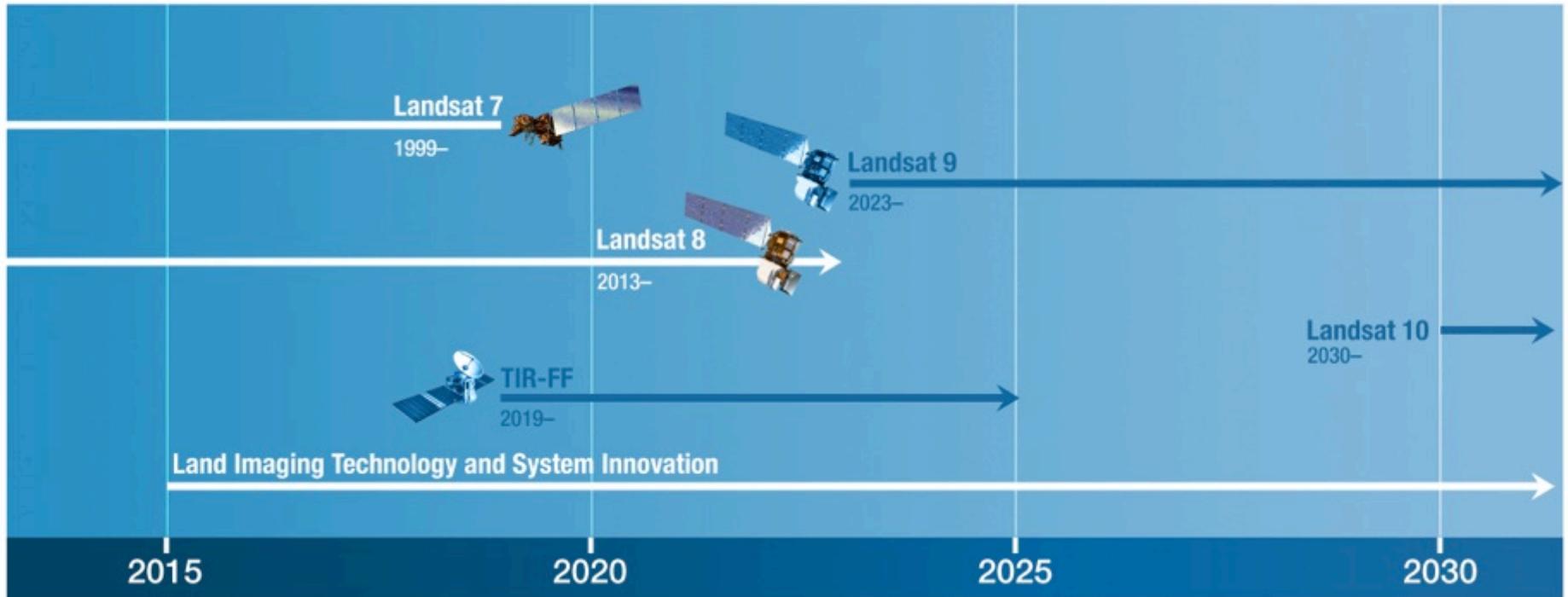
- Supports formulation and development of PRISM, NISAR, OCO-3, ICESat-2, GRAACE Follow-on, and SMOG.
- Multi-Decadal Sustainable Land Imaging (SLI) program provides high-quality, global land imaging measurements, involving Thermal-Infrared Free-Flyer (TIR-FF), Landsat 9 (full Class-B rebuild of Landsat 8), and Land Imaging Technology and System Innovation.
- Transfers T/SIS-1 and future ocean altimetry missions (after Jason-3) from NOAA to NASA, consistent with a revision of satellite responsibilities in which NOAA retains responsibility for weather satellites and NASA is the lead for other nondefense Earth-observing satellite missions.
- Supports the Venture Class Suborbital-2 investigation selections.
- Provides strong support for Research and Analysis.
- Operates 18 additional missions, and the Airborne Science project.



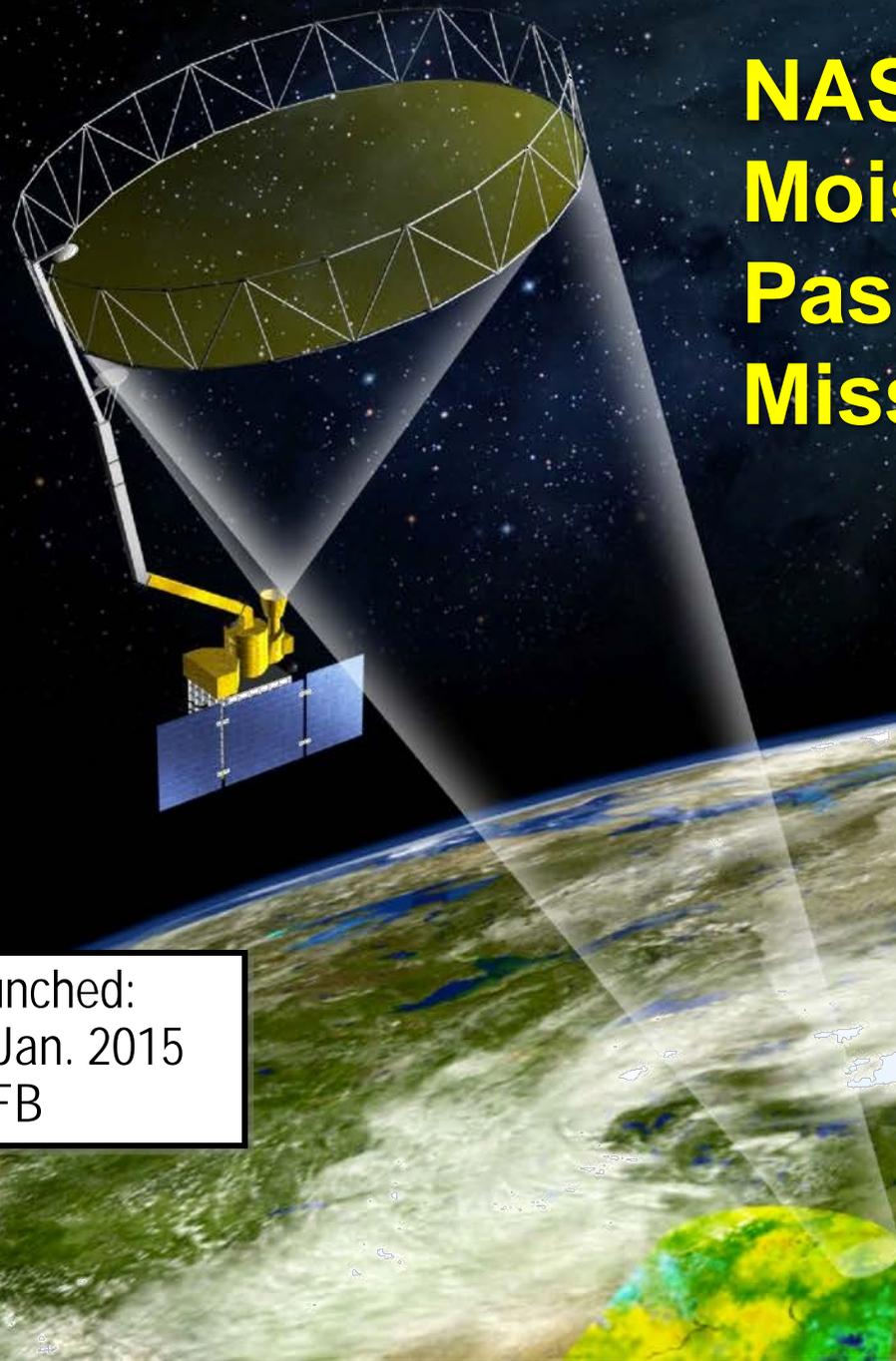
- ✧ The 3+1 part program, with the essential investments in technology and observational innovation to ensure a world class, sustainable, and responsible land imaging program through 2035:
 1. Class D Thermal Infrared Free Flyer (TIRFF_D) to launch ASAP (estimated NLT 2019) and to fly in constellation with a reflective band imager
 - Low cost mitigation against an early loss of the Landsat 8 Class C TIRS, while demonstrating feasibility of constellation flying
 2. Landsat 8 Repeat Build (L8RB) upgraded to a full Class B system, to launch in 2023
 - Low programmatic risk implementation of a proven system with upgrades to bring the whole system to Class B
 3. Sustained Technology and Systems Innovation (e.g., ACMS, hyperspectral)
 - Conducts hardware, operations and data management/processing investments to reduce risk in next generation missions.
 4. Landsat 10, Class B full spectrum, launch in 2030
 - Mission definition to be informed by the Technology investments in 2015 – 2018, leading to a key decision point around 2019

Landsat Future

Sustainable Land Imaging (SLI) Architecture



NASA's Soil Moisture Active Passive (SMAP) Mission



Delta II 7320-10C



Launched:
29 Jan. 2015
VAFB

45 Early Adopters



Uses Spanning Agriculture, Weather, Emergency Response, Human Health, and Military Readiness



- Formulation
- Implementation
- Primary Ops
- Extended Ops

SLI-TBD
Formulation in 2015

JPSS-2 (NOAA)

RBI
OMPS-Limb

[[TSIS-2]]

[[Future Altimetry]]

NI-SAR

PACE

SWOT

TEMPO

GRACE-FO (2)

ICESat-2

CYGNSS

RapidScat, CATS,
LIS, SAGE III (on ISS)

SMAP

SORCE

TRMM

QuikSCAT

[[TCTE]]

EO-1

Aquarius

Landsat-7
(USGS)

Terra

Suomi NPP
(NOAA)

Aqua

Landsat-8
(USGS)

CloudSat

CALIPSO

GPM

Aura

GRACE (2)

OSTM/Jason 2
(NOAA)

OCO-2

★ Contributing to Water Cycle Studies

★	Formulation
■	Implementation
■	Primary Ops
■	Extended Ops

