NASA Science Mission Directorate
Earth Science Division
Applied Sciences Program

Water Resources Application Area

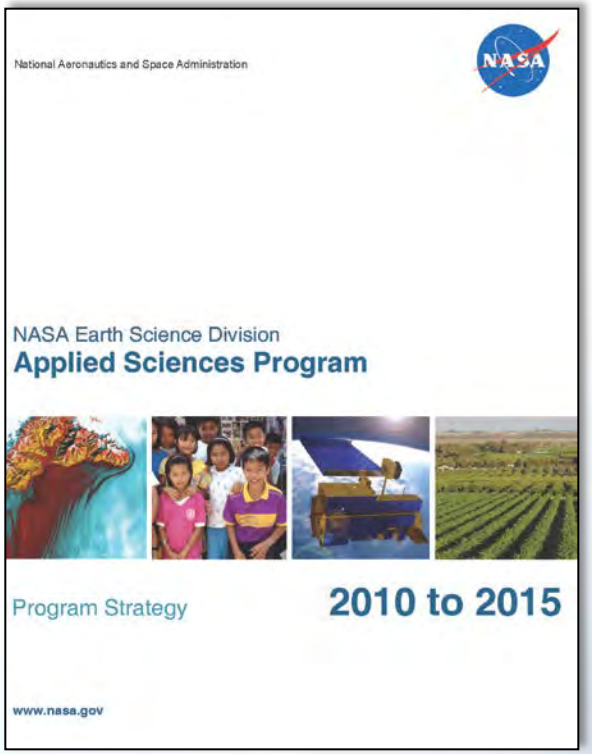
September 27-28, 2012

Applied Sciences Program Goals

Goal 1: Enhance Applications Research

Advance the use of NASA Earth science in policy making, resource management and planning, and disaster response.

Key Actions: Identify priority needs, conduct applied research to generate innovative applications, and support projects that demonstrate uses of NASA Earth science.



Goal 2: Increase Collaboration

Establish a flexible program structure to meet diverse partner needs and applications objectives.

Key Actions: Pursue partnerships to leverage resources and risks and extend the program's reach and impact.

Goal 3: Accelerate Applications

Ensure that NASA's flight missions plan for and support applications goals in conjunction with their science goals, starting with mission planning and extending through the mission life cycle.

Key Actions: Enable identification of applications early in satellite mission lifecycle and facilitate effective ways to integrate end-user needs into satellite mission planning.

Applications Areas

Emphasis in four Applications Areas

Health & Air Quality

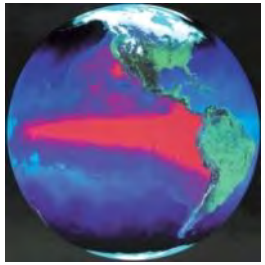
Water Resources

Disasters

Ecological Forecasting

Seek opportunities to expand to five additional areas

Agriculture



Climate

Weather

Energy

Oceans

Applications Areas

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

Applications Areas

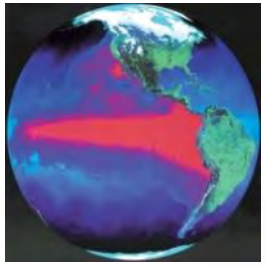
Ad hoc, informal activities in these areas

Capacity Building elements can do activities in these areas; however, there won't be as rich an applications base to draw on as in the emphasized Apps Areas

Examples:
GEO Agriculture Task
National Climate Assessment

Seek opportunities to expand to five additional areas

Agriculture



Climate

Weather

Energy

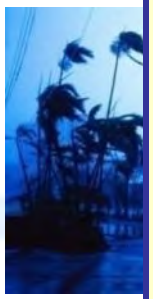
Oceans

Applications Areas

Emphasis in four Applications Areas

Seek opportunities to expand to five additional areas

Heal
Air Q



Disas

Weather

Forecasting

For all of the Applications Areas, we need to have a ~5-year plan. Plan will be based on market research identifying key needs, and plan will articulate priority activities for ESD/Applied Sciences for the area.

For Emphasized Areas:
- Plan articulates what we will do and when, such as solicitations, to address key needs and priorities

For Additional Areas:
- Plan articulates what we would do if ESD had a application area in this topic

National Aeronautics and Space Administration

Applied Sciences Program

Discovering Innovative & Practical Applications of NASA Earth Science

The Applied Sciences Program's Ecological Forecasting application area was featured in a recent Space News article. **Read More >>**

1 2 3

Earth Science Serving Society

The Applied Sciences Program promotes and funds activities to discover and demonstrate innovative uses and practical benefits of NASA Earth science data, scientific knowledge, and technology. The Program's portfolio of projects deliver results in applying NASA Earth science to support improvements in aviation safety, malaria early warning, agricultural productivity, water management, earthquake response, and many other important topics.

The Applied Sciences Program partners with public and private organizations on ways to apply data from NASA's environmental satellites and scientific findings in their decision-making activities and services, helping to improve the quality of life and strengthen the economy.

Application Areas

The Program focuses on economic, health, natural resources, and other themes to support both applied research and targeted, decision-support projects in 9 areas of national priority.

Disasters	Agriculture
Ecological Forecasting	Climate
Health & Air Quality	Energy
Water Resources	Oceans
	Weather

Applied Sciences and Water Resources Team

- ***Lawrence Friedl, Associate Director, Applied Sciences Program***

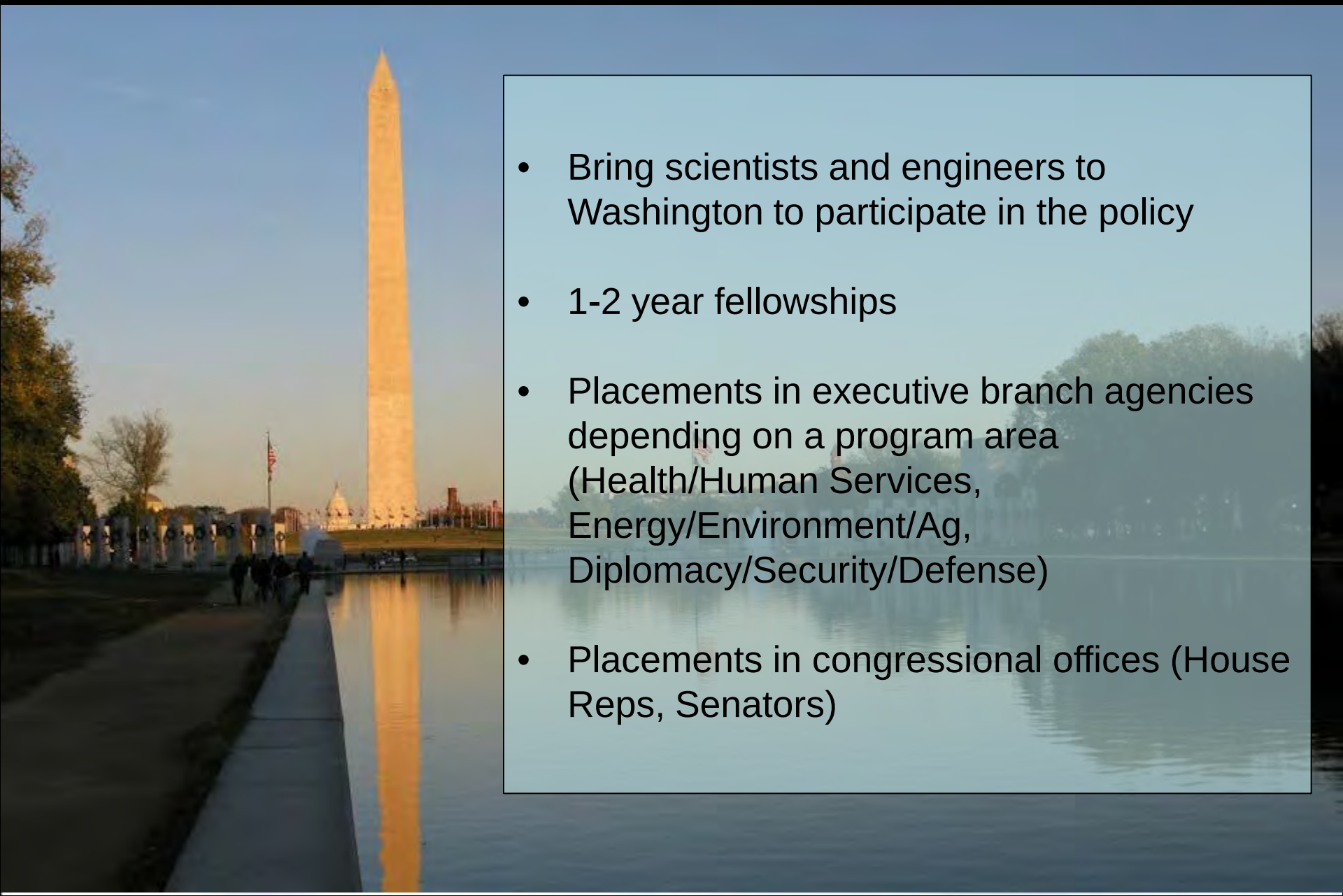
  - ***Bradley Doorn, PM, Water Resources Application Area***
  - ***Forrest Melton, Associate PM, Water Resources Application Area***
  - ***Karen Mohr, Associate PM, Water Resources Application Area***
  - ***Christine Lee, AAAS Fellow, NASA***

  - ***Nancy Searby, PM, Capacity Building***
  - ***Woody Turner, PM, Ecoforecasting Application Area***
  - ***John Haynes, PM, Health and Air Quality Application Area***
  - ***Frank Lindsey, PM, Disasters Application Area***

Good morning.

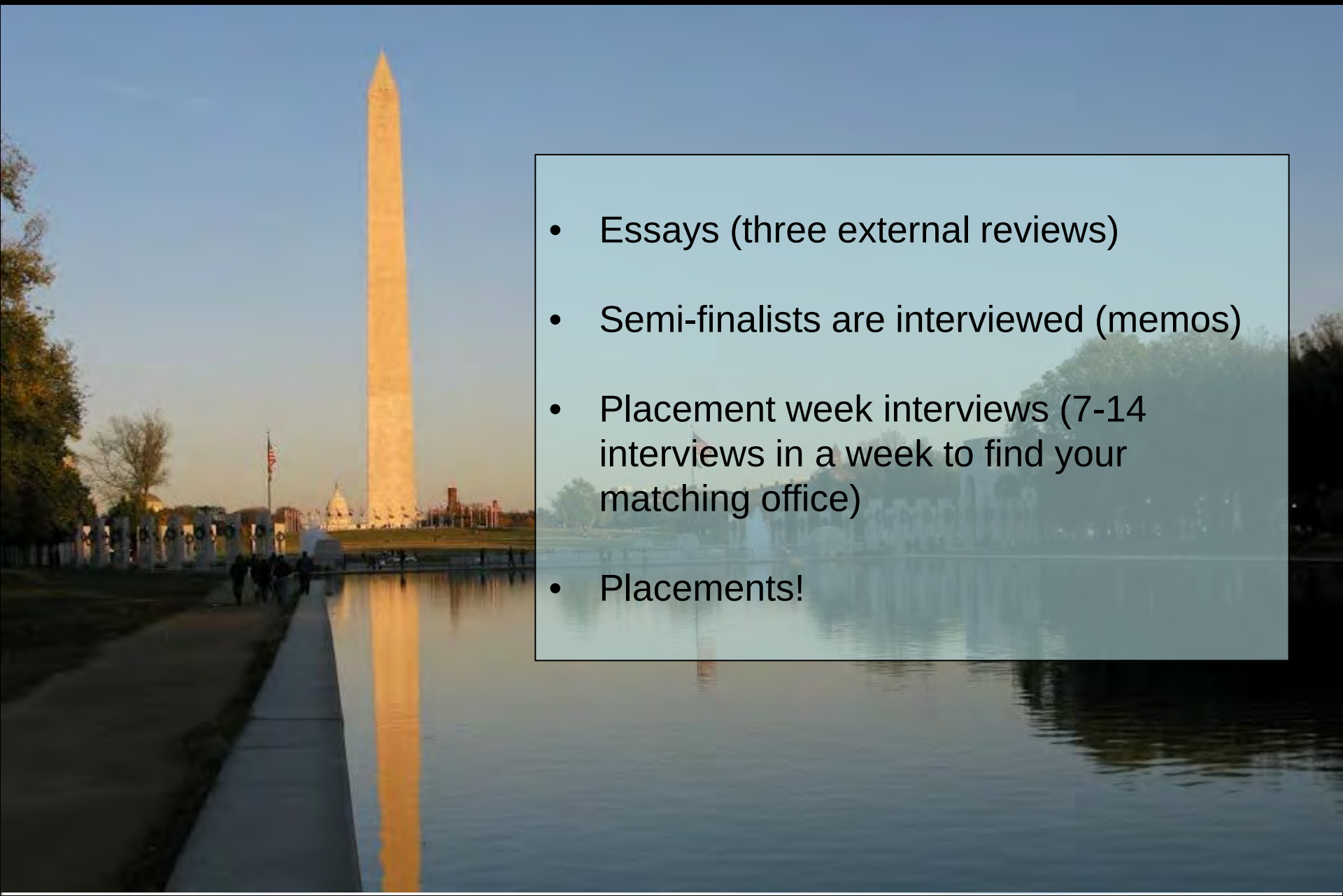
Christine M. Lee
AAAS Science and Technology Policy Fellow

What is a fellow?



- Bring scientists and engineers to Washington to participate in the policy
- 1-2 year fellowships
- Placements in executive branch agencies depending on a program area (Health/Human Services, Energy/Environment/Ag, Diplomacy/Security/Defense)
- Placements in congressional offices (House Reps, Senators)

Becoming a fellow



- Essays (three external reviews)
- Semi-finalists are interviewed (memos)
- Placement week interviews (7-14 interviews in a week to find your matching office)
- Placements!

Being matched w/ NASA Applied Sciences

Being matched w/ NASA Applied Sciences

Being matched w/ NASA Applied Sciences

Antarctica (from Scott Base, not McMurdo).

0.3% of Antarctica is ice free, often considered a Mars analog environment.

Overlying drivers.

How do we develop the best toolkit and approach for monitoring environmental (& public) health?

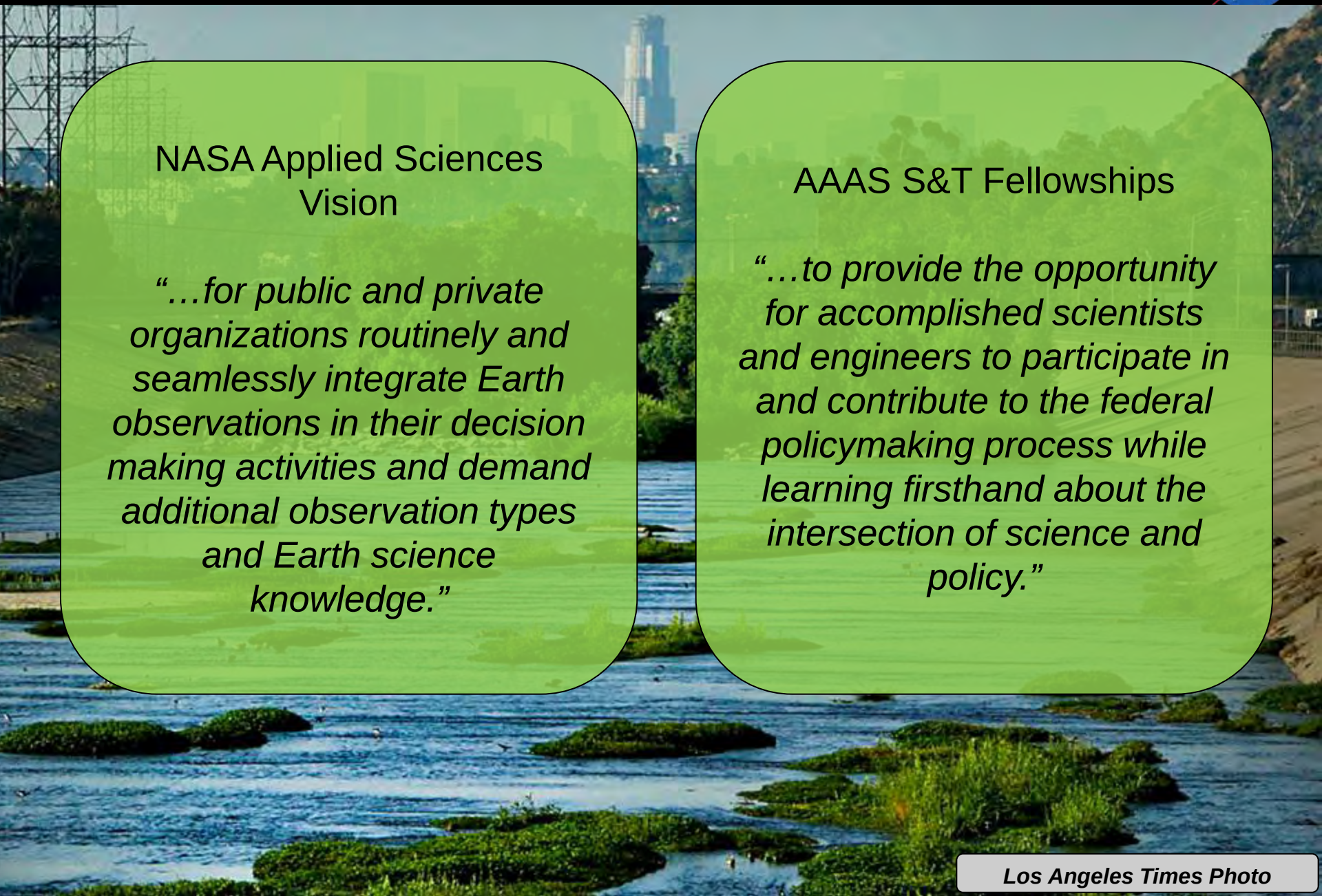
How do we connect the data collected with evidence-based policy/practices and with the public?

NASA Applied Sciences Vision

"…for public and private organizations routinely and seamlessly integrate Earth observations in their decision making activities and demand additional observation types and Earth science knowledge."

AAAS S&T Fellowships

"…to provide the opportunity for accomplished scientists and engineers to participate in and contribute to the federal policymaking process while learning firsthand about the intersection of science and policy."



Los Angeles Times Photo

Applied Sciences Program
Water Resources

Objective/Scope

Discovers and demonstrates applied uses of Earth Observations that address policy and decision processes related to water supply and demand. The Water Resources program funds applied research and applications projects in key functional categories; such as irrigation, flow and flood forecasting, drought monitoring, water quality, snow melt, and climate impacts.

Major partners and end-users:
DOI, NOAA, USACE, DOS, State DWR's, Local Water Authorities, Intl-NGOs.

Upcoming events:
- ROSES 2012-13 Solicitation
- ROSES 2011 Feas. trans to Dec.

Accomplishments

US Drought Monitor. Project reached milestone to integrate GRACE-based indicators into US Drought Monitor for monthly drought maps used in disaster payments, tax deferrals, etc.

Global Lake/Reservoir Monitor. Developed a system to extract height changes of major in-land reservoirs from radar altimetry measurements from Jason/TOPEX now utilized by USDA, USAID and multiple other agencies including DoD. NASA's SWOT mission will continue effort.

Global Agriculture Monitoring. Enhanced the capability of USDA to monitor global agriculture commodities for US market price discovery by seamlessly integrating NASA earth observation data and science into its process for determining this Principle Federal Economic Indicator.

Key Programmatic Interfaces

Intra-agency.
-Water-Energy Cycle Research
-Missions: SWOT, SMAP, LDCM, GRACE-FO/II

Inter-agency.
- Multiple Federal Agencies
- Western States Water Council/WestFAST
-Surface Water and Water Quality Subcommittee (CENRS)

International.
- USAID
-Agriculture and Water Tasks, Group on Earth Observations
- DOS – Water

Major Issues

A. Integrate Deputy Program Application Leads into SMAP, SWOT, and GRACE-FO mission development activities.

B. ROSES 2012 Solicitation.

B. Project/budget tracking system as well.

C. Water Resource challenges rising around the globe.

Historic U.S. Drought in 2012

Global Water Supply-Demand gaps turning in to more and more societal impacts (e.g. food, energy, political strain, …)

DROUGHT SOLICITATION:
Key Statistics: Recommended Proposals

PI Last name	Title	Proposing Organization
VERDIN	Fallowed Area Mapping for Drought Impact Reporting and Decision Making	GEOLOGICAL SURVEY US DEPT
PAINTER	Integration of precision NASA snow products with the operations of the Colorado Basin River Forecast Center to improve decision making under drought conditions	CALIFORNIA INSTITUTE OF TECHNOLOGY
HAIN	Development of a Mult-Scale Remote Sensing Based Framework for Mapping Drought over North America	UNIVERSITY OF MARYLAND
JUDGE	Integration of remote sensing observations and a web-based decision support system for managing impacts of agricultural droughts on crop yields in heterogeneous landscapes	UNIVERSITY OF FLORIDA
BIRKETT	The Global Reservoir and Lake Monitor (GRLM): Expansion and Enhancement of Water Height Products.	UNIVERSITY OF MARYLAND
MELTON	Mitigation of Drought Impacts on Agriculture through Satellite Irrigation Monitoring and Management Support	NASA AMES RESEARCH CENTER
VIVONI	Cloud Computing-based Delivery of Drought Information at Multiple Scales	ARIZONA STATE UNIVERSITY
JUSTICE	Global monitoring of agricultural drought: A contribution to GEO GLAM	UNIVERSITY OF MARYLAND
DOZIER	Assessing Water Resources in Remote, Sparsely Gauged, Snow-Dominated Mountain Basins	UC, SANTA BARBARA
KRAKAUER	Application of Evapotranspiration and Soil Moisture Remote Sensing Products to Enhance Hydrological Modeling for Decision Support in the New York City Water Supply	RFCUNY - CITY COLLEGE
ROSENZWEIG	Adaptation Planning for Climate Change Impacts using Advanced Decision Support and Remote Sensing: Irrigated Agriculture in California's Central Valley	NASA/GODDARD SPACE FLIGHT CENTER
MARGULIS	Investigating the Feasibility of Incorporating Remote Sensing and Earth Science Datasets into Existing Frameworks for Improving Water Supply and Drought Forecasts in California	UC, LOS ANGELES
Wardlow	The Quick Drought Response Index (QuickDRI): An Integrated Approach for	UNIVERSITY OF NEBRASKA, LINCOLN

……with Stakeholders

PI Last name	Title	Proposing Organization	Stakeholder Organization
VERDIN	Fallowed Area Mapping for Drought Impact Reporting and Decision Making	GEOLOGICAL SURVEY US DEPT	**NATIONAL INTERAGENCY DROUGHT INFORMATION SYSTEM (NIDIS)**
PAINTER	Integration of precision NASA snow products with the operations of the Colorado Basin River Forecast Center to improve decision making under drought conditions	CALIFORNIA INSTITUTE OF TECHNOLOGY	**COLORADO RIVER BASIN FORECAST CENTER**
HAIN	Development of a Mult-Scale Remote Sensing Based Framework for Mapping Drought over North America	UNIVERSITY OF MARYLAND	**UNITED STATES DROUGHT MONITOR (USDM)**
JUDGE	Integration of remote sensing observations and a web-based decision support system for managing impacts of agricultural droughts on crop yields in heterogeneous landscapes	UNIVERSITY OF FLORIDA	**PRIVATE SECTOR**
BIRKETT	The Global Reservoir and Lake Monitor (GRLM): Expansion and Enhancement of Water Height Products.	UNIVERSITY OF MARYLAND	**U.S. DEPARTMENT OF AGRICULTURE**
MELTON	Mitigation of Drought Impacts on Agriculture through Satellite Irrigation Monitoring and Management Support	NASA AMES RESEARCH CENTER	**WESTERN GROWERS ASSOCIATION, CA DWR**
VIVONI	Cloud Computing-based Delivery of Drought Information at Multiple Scales	ARIZONA STATE UNIVERSITY	**DEPARTMENT OF STATE**
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	The Quick Drought Response Index	UNIVERSITY OF NEBRASKA	

Water Resources in the Earth Science Division

Applied Remote Sensing Training (ARSET): Water Resources and Disaster Management

•Professional online and hands-on courses.

http://water.gsfc.nasa.gov

- Flooding/Drought: (TRMM/, MERRA, NLDAS): Latin America (Colombia/GEO, November 2011); South Central U.S. (U. of Oklahoma, June 2012)
- Coming up: Courses on snow satellite and model products: local and state agencies in California and Colorado River Basin, World Bank (Fall 2012/Spring 2013).
- Online course: Development of evapotranspiration topics and other land products (Spring 2013)

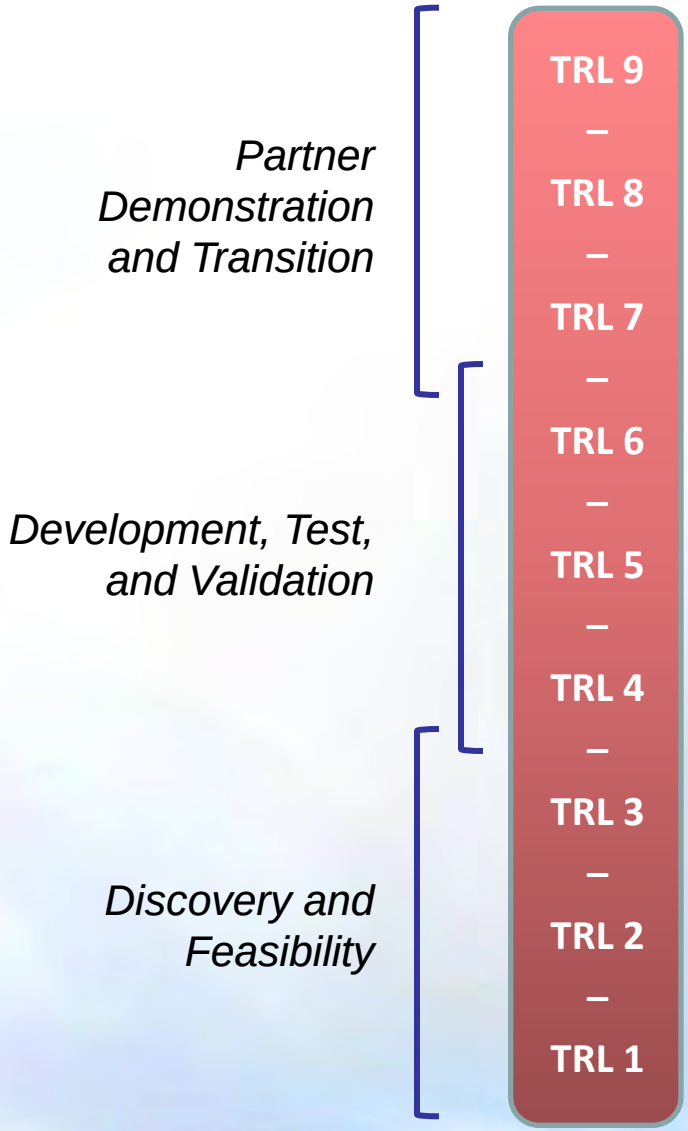
ARSET works directly with Applied Science PIs. ***We can help disseminate applied research & decision support tools.***

Ana.I.Prados@nasa.gov

Applications Readiness Levels

ARLs

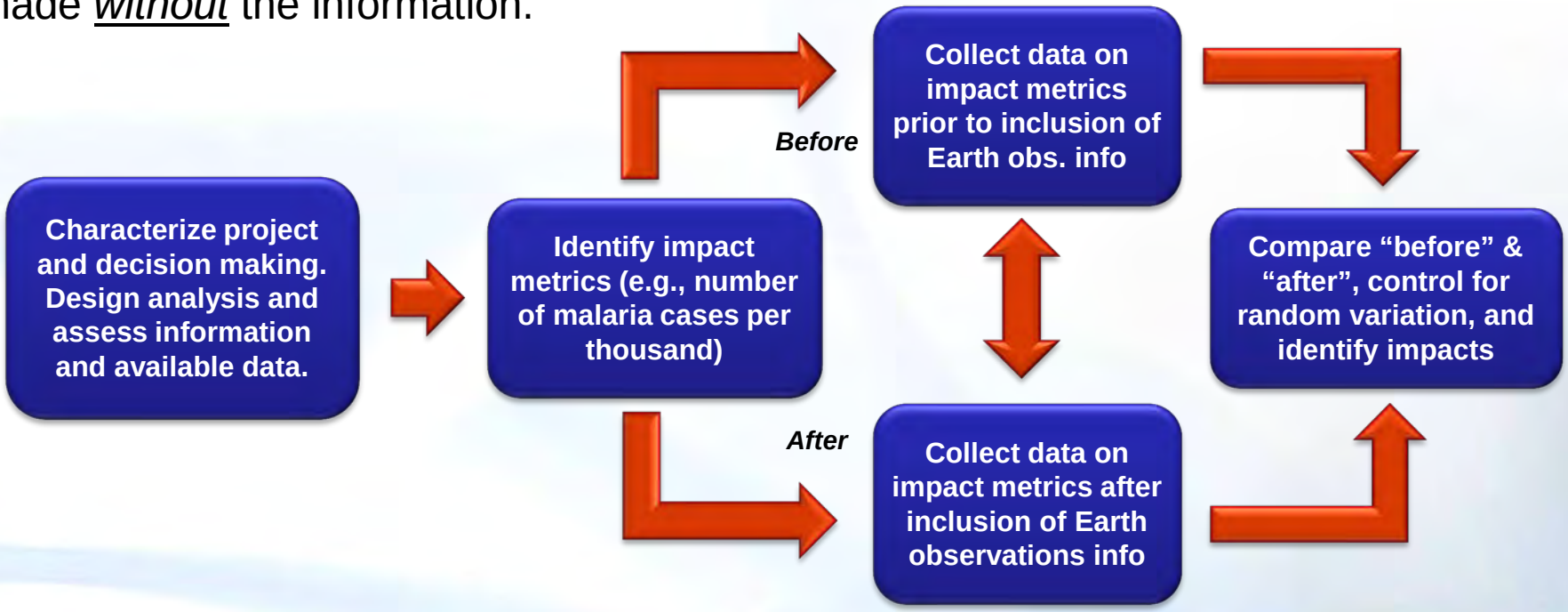
9. Approved, Operational Deployment and Use in Decision Making.
8. Application Completed and Qualified.
7. Application Prototype in Partners' Decision Making.
6. Demonstrate in Relevant Environment.
5. Validation in Relevant Environment.
4. Initial Integration and Verification (in Laboratory Environment).
3. Proof of Application Concept.
2. Application Concept .
1. Basic Research.



Impact Analyses

General Approach

The analysis used an adapted expected value of information (VI) methodology to assess the benefits. The value of information is a function of the benefits that result from a decision *with* information compared to the decision that would have been made *without* the information.



Using this approach, the value of information provided by a project would be:

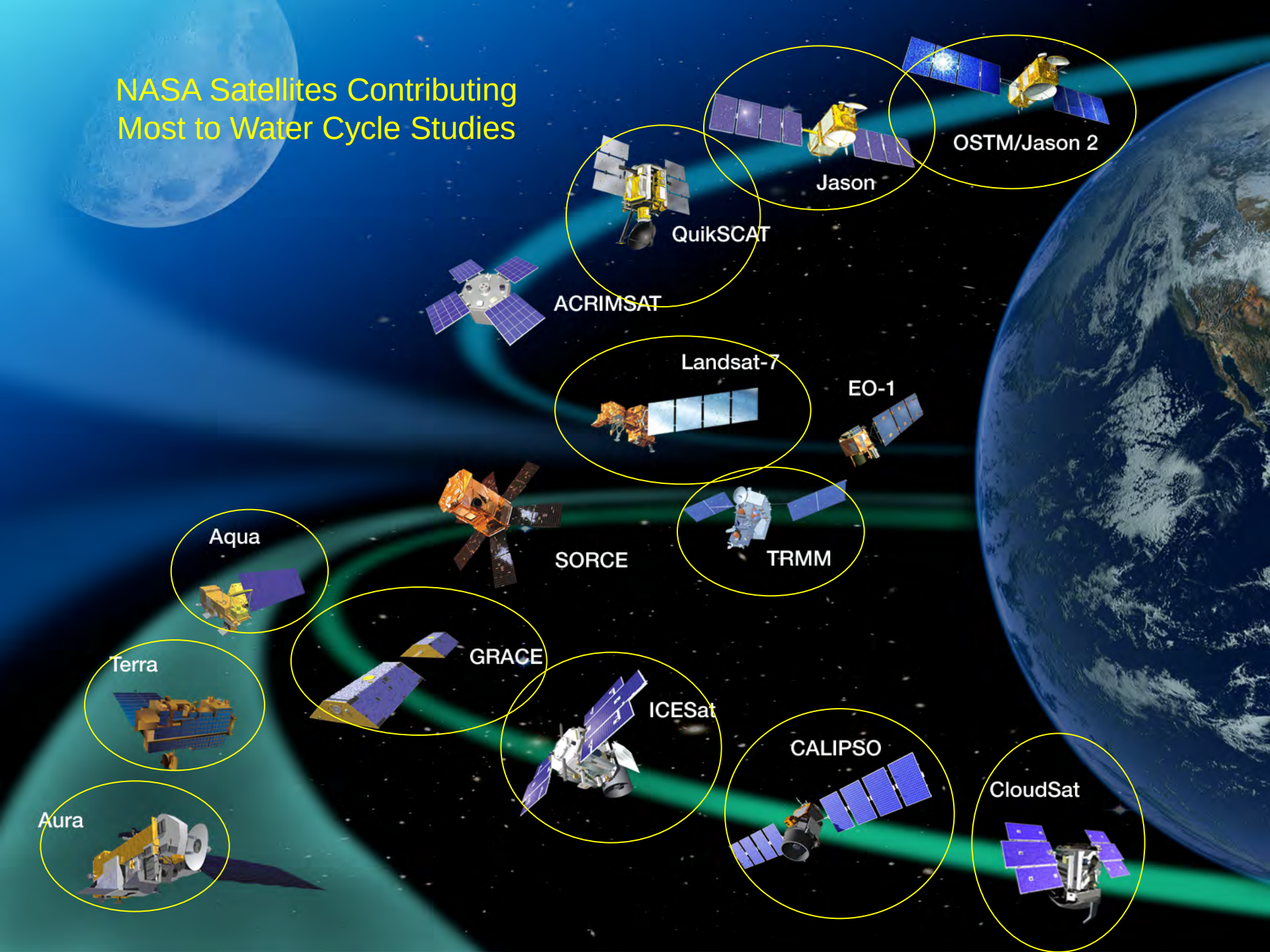
Value of Earth obs. info = (Outcome with information – Outcome without information)

Satellite Mission Update: Water Resource Applications

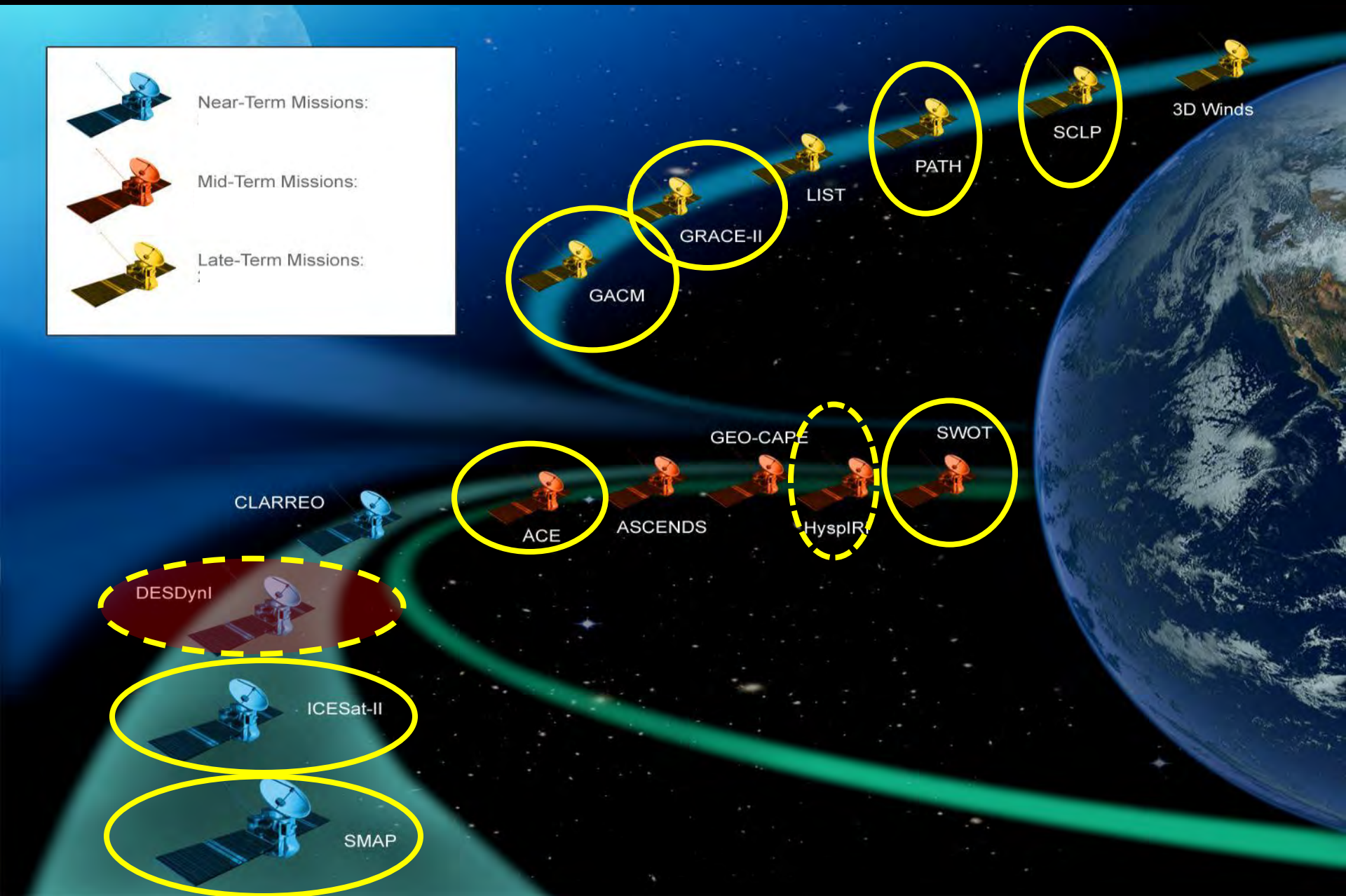
Remote Sensing Workshop

27-28 September 2012

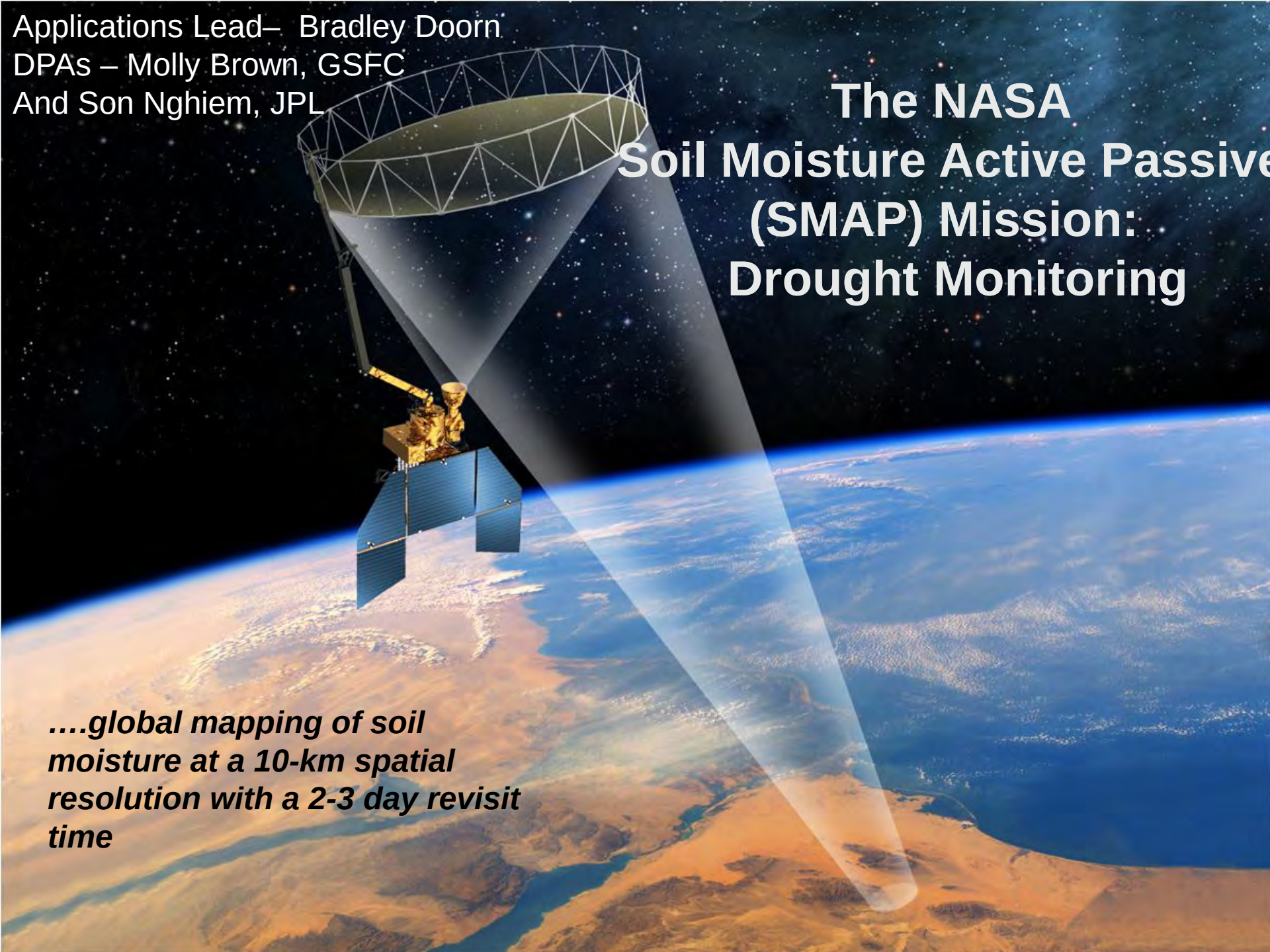

Earth Science
Missions in Operation
Aquarius
OSTM/Jason 2 (NOAA)
Jason
QuikSCAT*
TRMM
EO-1
Landsat-7 (USGS)
Aqua
ACRIMSAT
Terra
SORCE
GRACE (2)
Aura
CALIPSO
CloudSat
NPP


NASA Satellites Contributing
Most to Water Cycle Studies
Jason
OSTM/Jason 2
QuikSCAT
ACRIMSAT
Landsat-7
EO-1
SORCE
TRMM
Aqua
GRACE
Terra
ICESat
CALIPSO
CloudSat
Aura

Decadal Survey Missions Next Generation



Applications Lead– Bradley Doorn
DPAs – Molly Brown, GSFC
And Son Nghiem, JPL

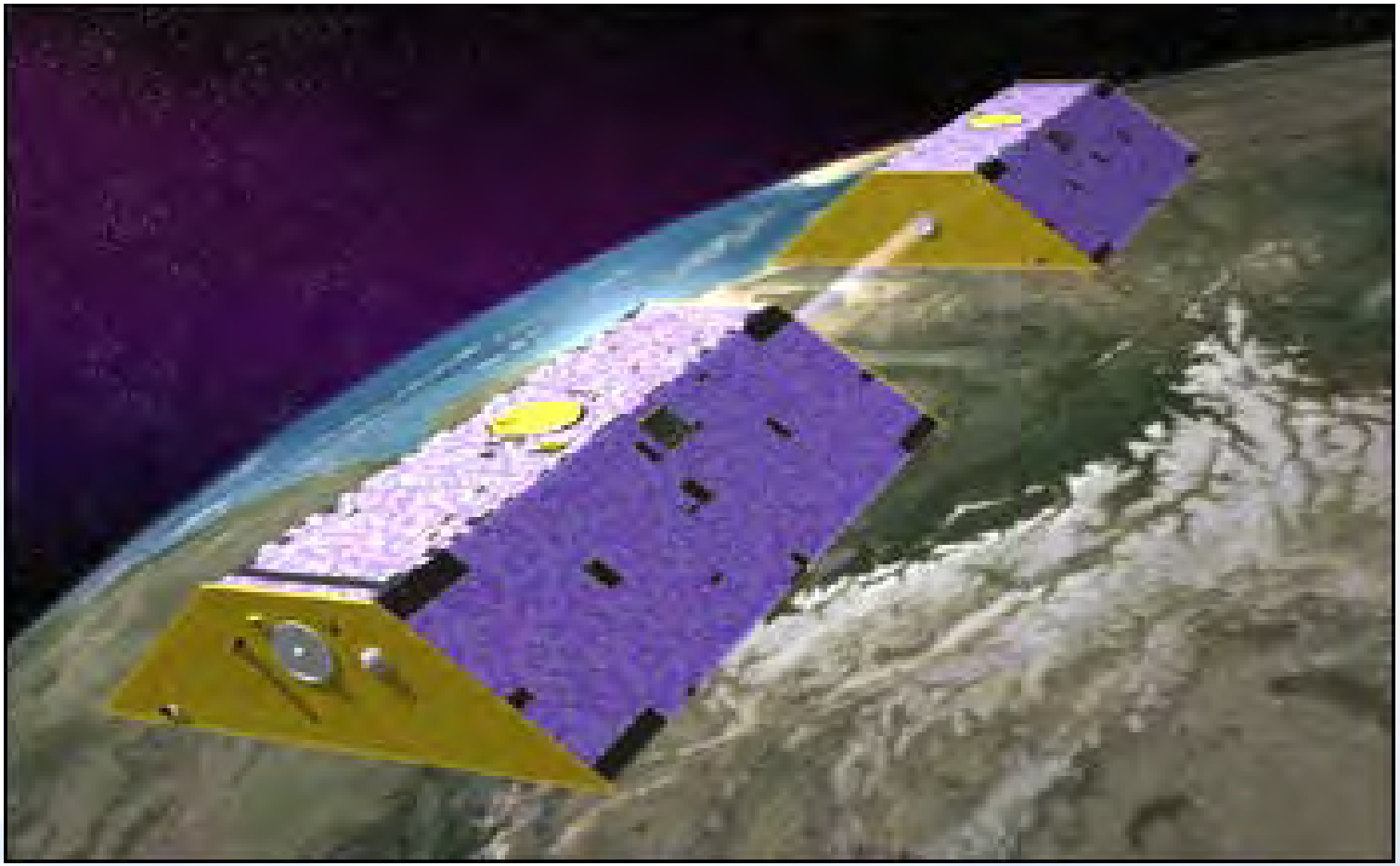


The NASA Soil Moisture Active Passive (SMAP) Mission: Drought Monitoring

….global mapping of soil moisture at a 10-km spatial resolution with a 2-3 day revisit time

GRACE and GRACE-FO

Application PM – Doorn, DPA – Erik Ivins, JPL; John Bolten, GSFC



Gravity Recovery and Climate Experiment

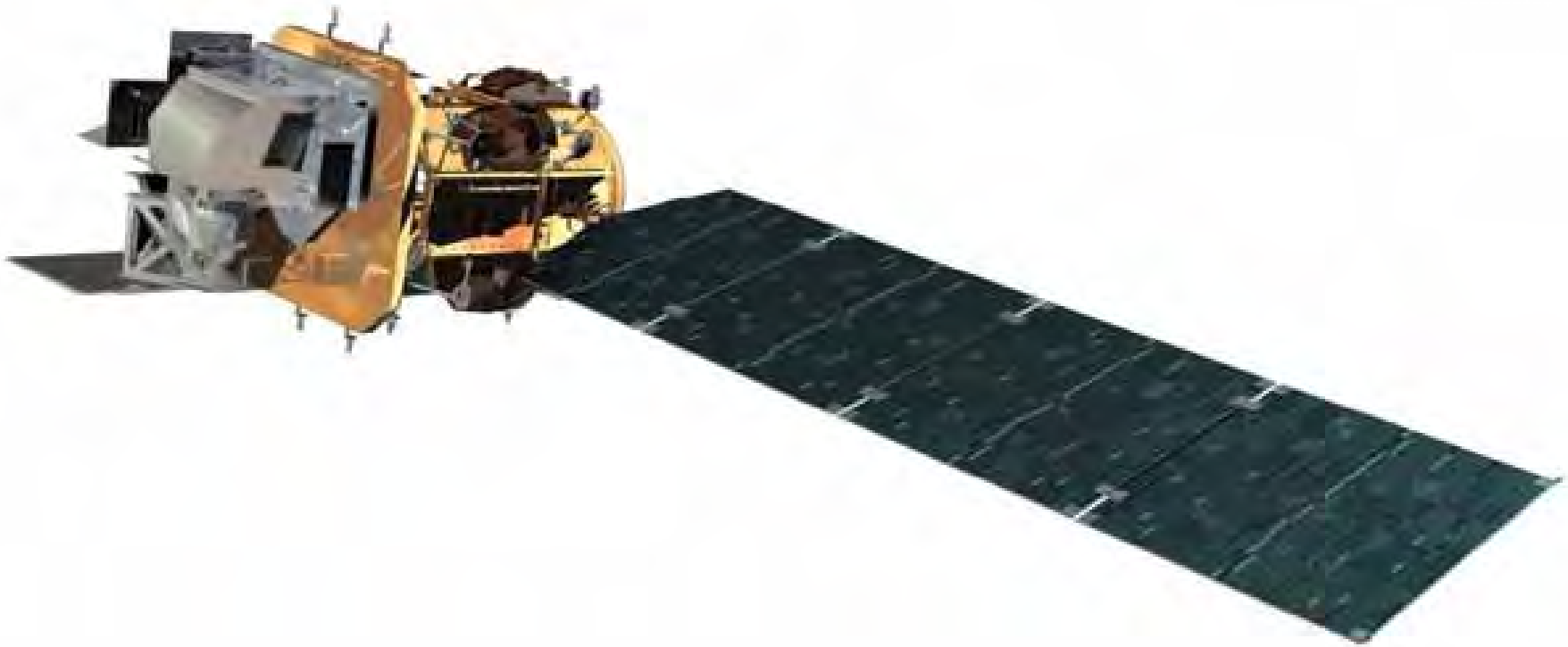
Surface Water and Ocean Topography (SWOT) Mission

Applications Lead – Bradley Doorn, HQ

DPAs - Margaret Srinivasan, JPL

and Craig Peterson, SSC

Landsat Data Continuity Mission (aka Landsat 8)



Courtesy of Orbital

Launch Vehicle

- Launch from Vandenberg Air Force Base on an Atlas V

Questions

Bradley Doorn, Bradley.Doorn@nasa.gov

Christine M. Lee, Christine.M.Lee@nasa.gov