# 8th HysplRI Science and Applications Workshop

## Objectives, Overview and Update


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**October 13, 2015**

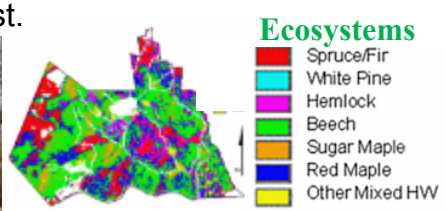
# HyspIRI Objectives and Approach

## Global Science and Applications Research

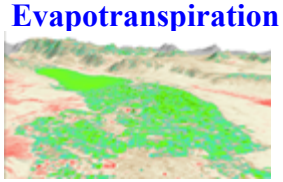
**Climate:** Ecosystem biochemistry, condition & feedback; spectral albedo; carbon/dust on snow/ice; biomass burning; ET
**Ecosystems:** *Global* biodiversity, plant functional types, physiological condition, and biochemistry including agricultural lands
**Fires:** Fuel status; fire frequency, severity, emissions, and patterns of recovery *globally*
**Coral reef and coastal habitats:** *Global* composition and status
**Volcanoes:** Eruptions, emissions, regional and *global* impacts
**Geology and resources:** *Global* distributions of surface mineral resources and improved understanding of geology and related hazards
**Applications:** Disasters, EcoForecasting, Health/AQ, Water

## Global Mission Urgency

The HyspIRI science and applications objectives are critical today and uniquely addressed by the combined imaging spectroscopy, thermal infrared measurements, and IPM direct broadcast.





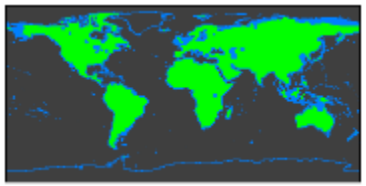


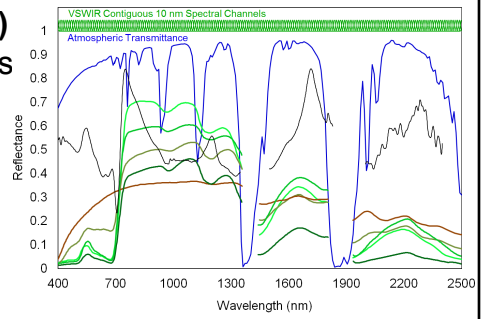

## Measurement

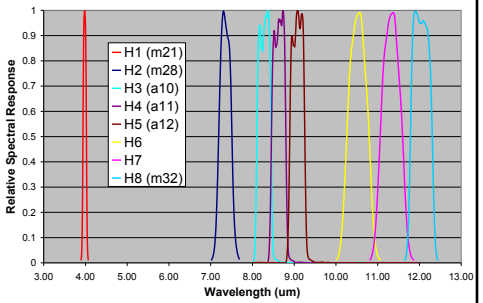
**Imaging Spectrometer (VSWIR)**
- 380 to 2500nm in ≤10nm bands
- 30 m spatial sampling
- 16 days revisit
- Global land and shallow water

**Thermal Infrared (TIR)**
- 8 bands between 4-12 µm
- 60 m spatial sampling
- 5 days revisit; day/night
- Global land and shallow water

**IPM-Low Latency data subsets**





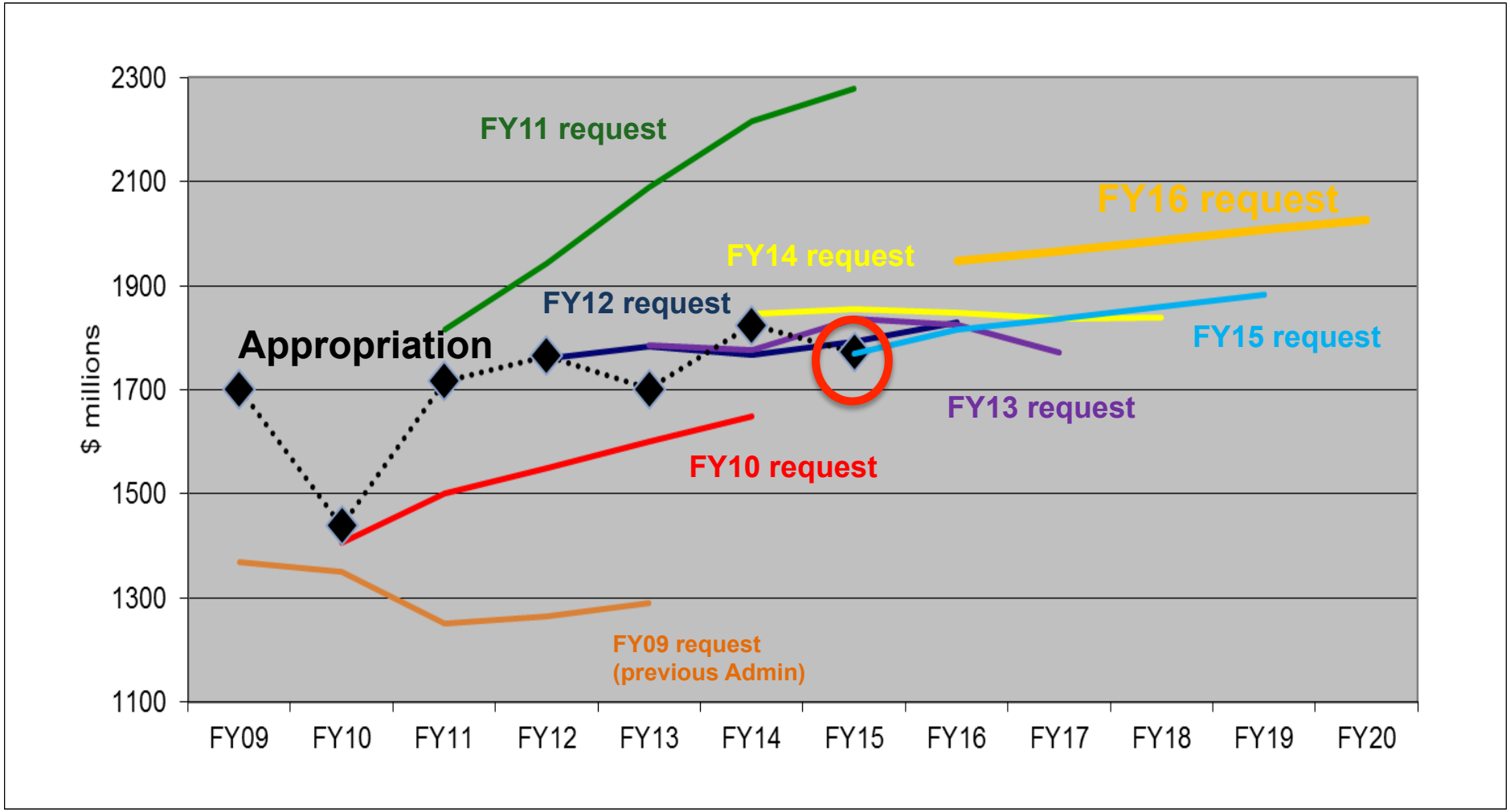

## Mission Concept Status

**Level 1 Measurement Requirements:** Vetted by community at workshops and in literature (100s of refereed journal articles)
**Payload: VSWIR** Imaging Spectrometer, **TIR** Multi-spectral Radiometer, and **Intelligent Payload Module (IPM)**
**Original 60 m DS option:** Mature
**ISS options:** VSWIR & TIR Mature, ECOSTRESS EVI selected
**Separate Smallsat Mission option:** VSWIR and TIR solutions developed with TEAM I/X
**SLI Compatible Option:** HyspIRI VSWIR being evolved to 30 m at 185 km swath and 16 day global revisit. Requires Dyson spectrometer architecture and other technologies.
**Near term option:** Global with 45 km- or 90 km-swath at 30 m
**Preparatory airborne campaigns:** Measurements used to advance and refine science, applications, algorithms, and data processing

# Workshop Objectives

- **Tuesday**
  - Technology (IPM, smallsat studies, Dyson spectrometer)
  - Fire and Volcano Science with aircraft (past and planned)
  - Aquatic session (HASG, CORAL/corals, HABs, kelp)
- **Wednesday**
  - Airborne results and plans for new campaigns
  - Terrestrial Ecosystems
  - Methane, aerosols, land surface radiation and energy
- **Thursday**
  - ECOSTRESS
  - Surface Composition/Geology
  - Applied Sciences
  - Cryosphere
- **Breakout Groups All 3 days: Decadal Survey Initial White Paper Outlines**

# Earth Science Budget
## FY16 Request and Appropriation



# Overall FY15 Progress: 2015 Guidance Memo Actions Completed

| Guidance Memo Actions | Status | Actions Taken |
|---|---|---|
| 1. Continue to build broad community support with workshops and symposia | ✓ | Symposium held Jun 3rd - 5th at GSFC;<br>Workshop scheduled for Oct 13th - 15th at Caltech;<br>29 abstracts received for AGU session in December;<br>Special Issue of *Remote Sensing of Environment* journal |
| 2. Continue to conduct HyspIRI data product generation and benchmarking with airborne data | ✓ | Finishing 3-year California campaign;<br>Routinely generating L1 and L2 from VSWIR and TIR data;<br>CY16 start of Volcano and Coral Reef campaign in Hawaii;<br>Small aircraft tests: IPM/spectrometer data throughput (LaRC) |
| 3. Continue instrument/mission trade studies to provide lower cost and more adaptable instrument and/or mission approaches | ✓ | Smallsat Team-X studies for VSWIR and TIR:<br>improved design, data volume, cost, risk and heritage |
| 4. Continue to explore options to ensure the HyspIRI VSWIR and TIR instruments meet the Sustainable Land Imaging (SLI) measurement requirement | ✓ | Both smallsat studies were designed to be consistent with the SLI global measurement requirements. The VSWIR instrument requires an F/1.8 Dyson spectrometer solution. |
| 5. Develop a plan for utilizing the ECOSTRESS mission results for HyspIRI risk reduction | ✓ | Implementing plan to support HyspIRI TIR component with ECOSTRESS measurement and reduce risk. |
| 6. Continue to engage potential international and domestic partners in addressing opportunities to lower the cost of a potential mission while maintaining Level 1 mission requirements | ✓ | Discussions with ISRO and CNES on joint concepts;<br>Discussions with DLR, USGS and SLI on needs and complementarity; Formal connection to DLR EnMAP sampling imaging spectrometer mission; New methods for VSWIR band convolution to multispectral bands |
| 7. Augment the planned FY15 tasks to further HyspIRI risk reduction utilizing the FY15 ~$1,000K over guide | ✓ | Tasks identified in Feb 2015 and implemented through FY15. Some elements are costed in September. |
| 8. Complete the comprehensive development report of the HyspIRI mission study activities | ✓ | Complete report available on the HyspIRI website: http://hyspiri.jpl.nasa.gov/comprehensive-development-report. |

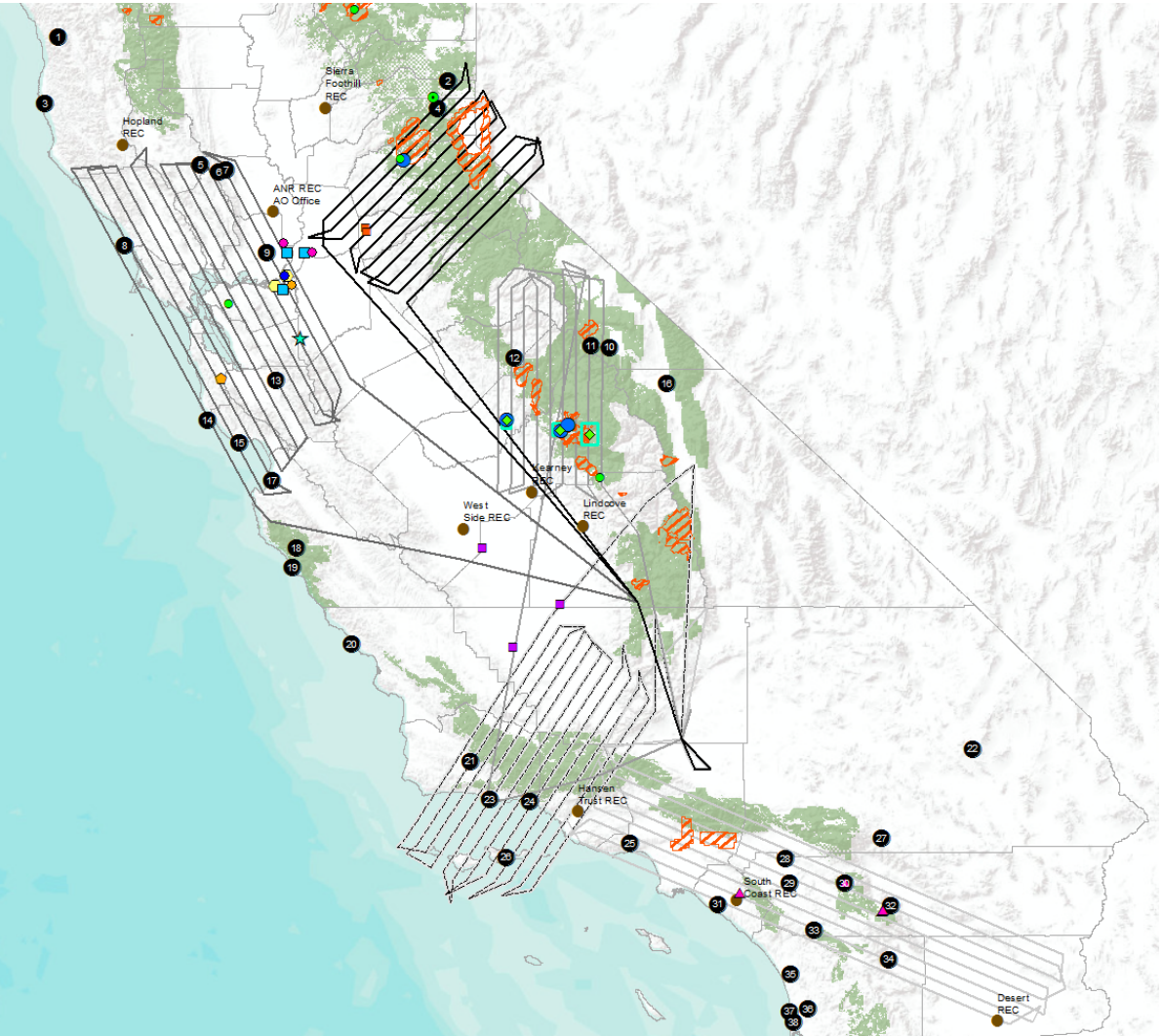
# Pre-Formulation Review

- In guide FY16 funding level from 2015 guidance = $2M
- Requested over guide funding of $1M for a $3M total
- Request from Eric Ianson, response due 10/16
  - “HyspIRI – Provide more fidelity on the overguide request to help assist in making decisions where to place any overguide funds, assuming a total less than the full overguide request”
- Draft 2016 guidance memo with Eric Ianson with a target release date of end October

# HysplRI Airborne Preparatory Mission

## 3 Seasonal Flights Over 5 Boxes/Soda Straw in 2013, 2014, 2015 To Simulate HysplRI Satellite Imagery

| ER-2 Altitude | AVIRIS Resolution | AVIRIS Swath | MASTER Resolution | MASTER Swath |
|---|---|---|---|---|
| 65,000 ft | 20 m | 12 km | 50 m | 35 km |





**PI TEAM:**

- Wendy Calvin/University of Nevada - Reno
- Matthew Clark/Sonoma State University
- Bo-Cai Gao/Naval Research Laboratory
- Bernard Hubbard/U. S. Geological Survey
- Darrel Jenerette/University of California, Riverside
- Thomas Kampe/NEON
- Raphael Kudela/University of California, Santa Cruz
- Ira Leifer/University of California, Santa Barbara
- Dongdong Wang/University of Maryland
- Paul Moorcroft/Harvard University
- Dar Roberts/University of California, Santa Barbara
- Philip Townsend/University of Wisconsin-Madison
- Susan Ustin/University of California, Davis
- Jan van Aardt/Rochester Institute of Technology

# HyspIRI Volcano and Coral Reef Airborne Campaign

A.45 HyspIRI Preparatory Airborne Activities and Associated Science: Coral Reef and Volcano Research

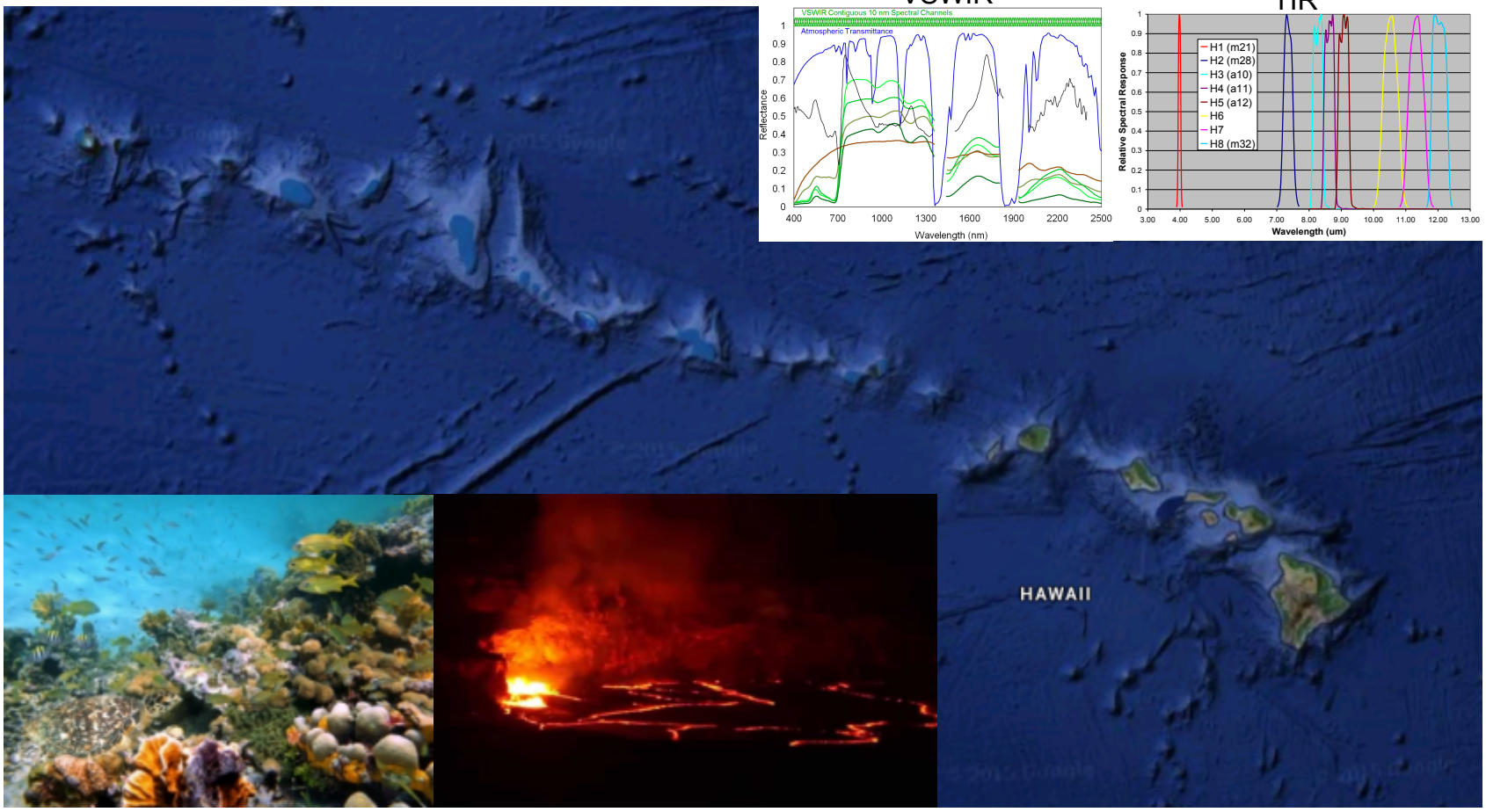
- 10 investigations selected
- Data acquisition in 2016
- Test Level 1 and 2 products for VSWIR and TIR HyspIRI-type measurements
- Advance maturity of higher level products and related algorithms

VSWIR




TIR



# 2017 Decadal Survey for Earth Science and Applications from Space

- Sponsors: NASA, NOAA, USGS
- Statement of Task complete & available online
- Steering Committee Co-Chairs: Waleed Abdalati & Tony Busalacchi
- Call for nominations for membership
- Assess progress in addressing major science & applications challenges in 2007 DS & reconsider scientific priorities for missions in 2007 DS
- Develop prioritized list of top science & applications challenges to guide space-based Earth observation for 10 years from 10/1/2017
- Identify gaps & opportunities at NASA, NOAA, USGS in pursuing challenges
- Recommend approaches for robust, resilient, & balanced US program
- Assemble set of prioritized strategic “science targets”
  - A science target comprises a set of science objectives that could be pursued and significantly advanced by means of a space-based observation.
- Consider programmatic balances
- Call for Initial White Papers

# Call for Initial White Papers

- Online at http://sites.nationalacademies.org/SSB/SSB_167627
- Online submissions of ~1500 words or less requested by November 2, 2015
- Responses to be posted publicly
- To inform initial organization and structure of committee and panels
- Three questions:
  1. What are the key challenges or questions for Earth System Science across the spectrum of basic research, applied research, applications, and/or operations in the coming decade?
  2. Why are these challenge/questions timely to address now especially with respect to readiness?
  3. Why are space-based observations fundamental to addressing these challenges/questions?
- Focus responses on role for space-based observations and comment on:
  a. Whether existing and planned U.S. and international programs will provide the capabilities necessary to make substantial progress on the identified challenge and associated questions. If not, what additional investments are needed?
  b. How to link space-based observations with other observations to increase the value of data for addressing key scientific questions and societal needs;
  c. The anticipated scientific and societal benefits; and
  d. The science communities that would be involved.
- The breakout sessions will seek to generate outlines for these short white papers.
- We need you help.

# Thank You