

National Aeronautics and Space Administration



# NASA Earth Science Division Earth Venture – 2 Pre-Proposal Workshop

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# OUTLINE



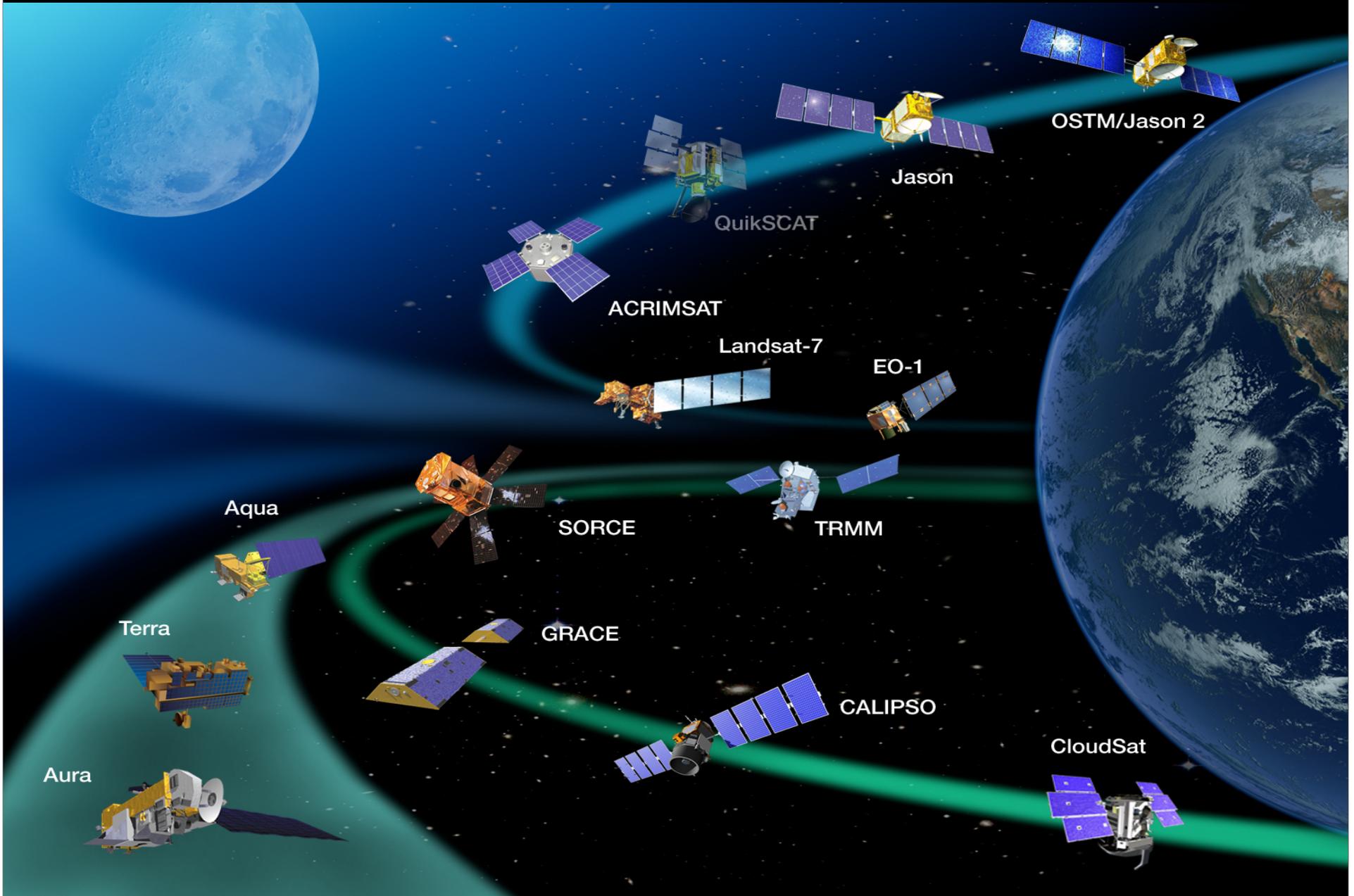
- ◆ Earth Science Division Objectives
- ◆ Decadal Survey and Science/Applications
- ◆ EV-2
- ◆ EV-Instrument
- ◆ Implementation of the Venture Line

# NASA's Commitment to a Broad Earth System Science Program



- ◆ NASA's current fleet on orbit is mature and generally healthy, and continues to provide calibrated validated data sets being used with increasing return by users world wide
- ◆ Our missions currently in development will continue many of the EOS legacy measurements and will initiate many others
  - NOAA will be picking up some of the measurements (TSIS, CERES, VIIRS, OMPS, Ocean altimetry, ...)
- ◆ The Venture line is an important part of the overall Earth Science program, enabling advancement on many fronts and levels
  - Directed missions/measurements – GPM, ICESat-2, SAGE III, OCO-2
  - Airborne science campaigns – IceBridge, EV-1
  - **Competitively selected, PI-led small science missions – EV-2**
  - Competitively selected, PI-led facility instruments – EV-Instruments
  - Technology investments – ESTO, GPS TriG
  - Comprehensive integrated science – R&A, modeling
  - Infrastructure – Geodetic Networks, High speed computing

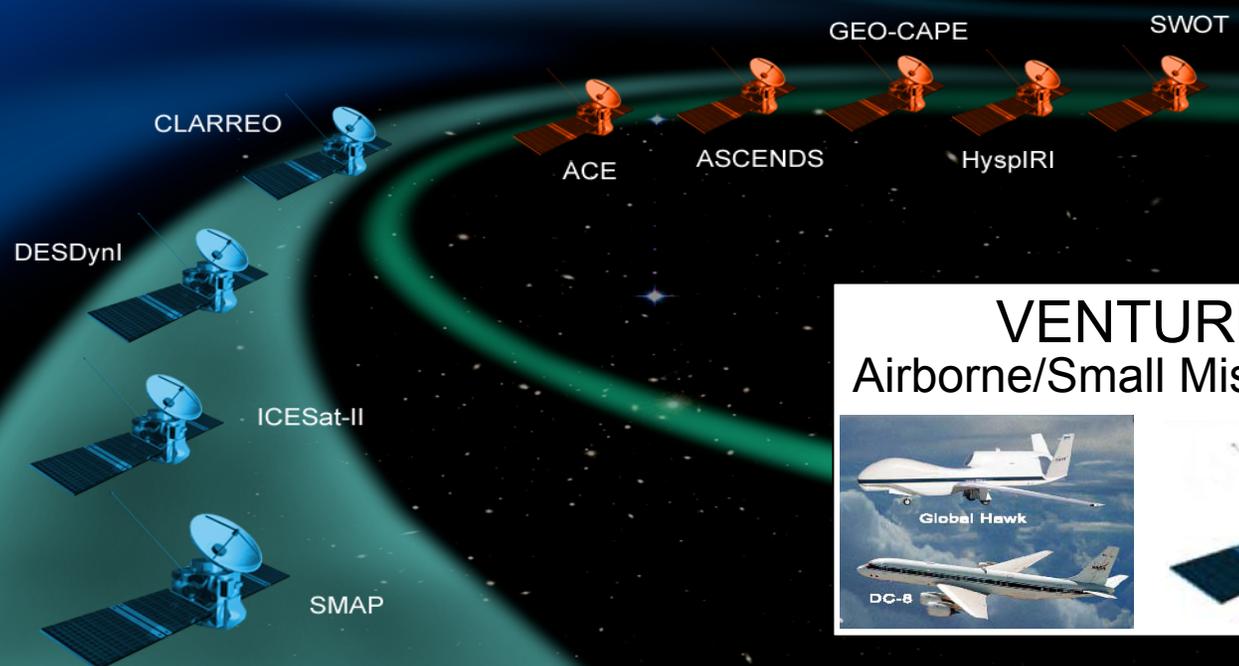
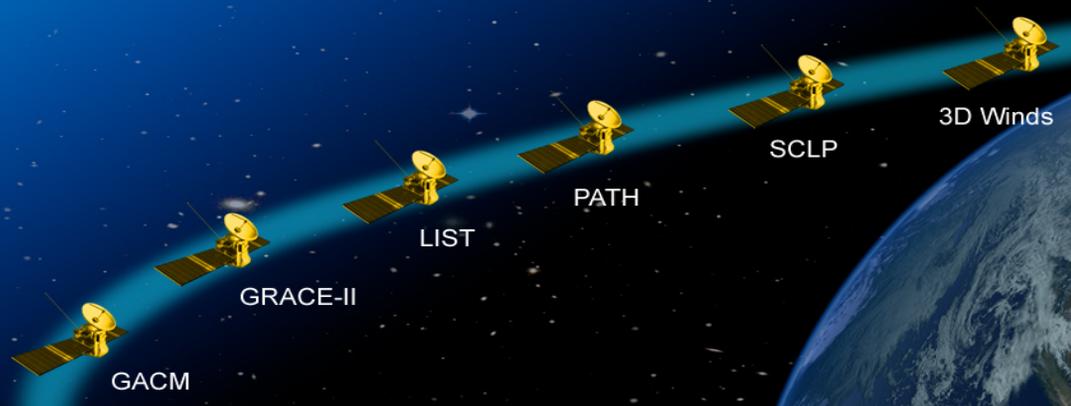
# NASA's Existing Earth Science Fleet



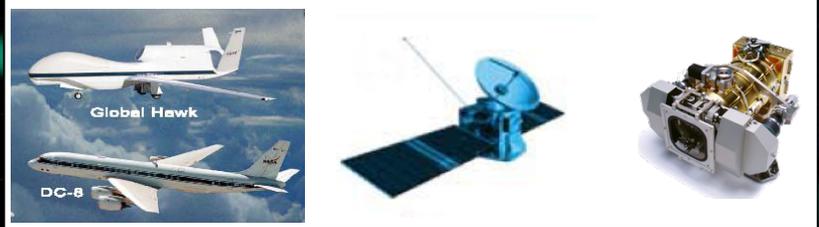
# Decadal Survey Flight Recommendations



Near-Term Missions:  
Mid-Term Missions:  
Late-Term Missions:



## VENTURE-CLASS Airborne/Small Missions/Instruments



# Decadal Survey Venture-Class Recommendations



***“... As part of this strategy, to restore more frequent launch opportunities and to facilitate the demonstration of innovative ideas and higher-risk technologies, NASA should create a new Venture class of low-cost research and application missions (~\$100M to \$200M). These missions should focus on fostering revolutionary innovation and on training future leaders of space-based Earth science and applications.*”**

Priority would be given to cost-effective, innovative missions rather than those with excessive scientific and technological requirements. The Venture class could include stand-alone missions that ***use simple, small instruments, spacecraft, and launch vehicles; more complex instruments of opportunity flown on partner spacecraft and launch vehicles***; or complex sets of instruments flown on suitable suborbital platforms to address focused sets of scientific questions.

Key to the success of such a program will be maintaining a steady stream of opportunities for community participation in the development of innovative ideas, which requires that strict ***schedule and cost guidelines be enforced for the program participants.*”**

# Venture Class – ESD Objectives



- ◆ ESD considers establishment and sustained, successful implementation of Venture-class to be a “Tier-1” priority from the Decadal Survey
  - Advances science/applications and promotes community involvement through frequent, regular proposal opportunities
  - Ensures overall program scientific flexibility and responsiveness through constrained development schedules
  - Provides an essential programmatic path to develop exploratory science

Venture-class is ***complementary*** to identified systematic missions; no single Venture-class mission is essential for overall ESD program.

- ◆ Cost/Schedule constraints will be enforced - absolutely
  - Only way to ensure availability for funding for regular solicitations
  - Only way to ensure programmatic flexibility/responsiveness
  - Cancellation is the result for breaking cost/schedule constraints

# Decadal Survey Venture Line



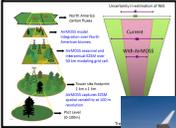
EV-1:  
Sustained Sub-  
Orbital  
Investigations

EV-Instrument:  
Full function,  
facility-class  
instruments  
Missions of  
Opportunity  
(MoO)

EV-2:  
Complete,  
self-  
contained,  
small  
missions

- ◆ EV-2 specifically allows NASA's ESD to pursue higher risk (Class D missions) with high potential science return <sup>8</sup>

# Earth Venture-1 Selection Summaries



## Airborne Microwave Observatory of Subcanopy and Subsurface (AirMOSS) - Univ Mich/JPL

North American ecosystems are critical components of the global exchange of the greenhouse gas carbon dioxide and other gases within the atmosphere. To better understand the size of this exchange on a continental scale, this investigation addresses the uncertainties in existing estimates by measuring soil moisture in the root zone of representative regions of major North American ecosystems. Investigators will use NASA's Gulfstream-III aircraft to fly synthetic aperture radar that can penetrate vegetation and soil to depths of several feet.



## Airborne Tropical Tropopause Experiment (ATTREX) - ARC

Water vapor in the stratosphere has a large impact on Earth's climate, the ozone layer and how much solar energy the Earth retains. To improve our understanding of the processes that control the flow of atmospheric gases into this region, investigators will launch four airborne campaigns with NASA's Global Hawk remotely piloted aerial systems. The flights will study chemical and physical processes at different times of year from bases in California, Guam, Hawaii and

**AO Released in FY2009  
Selections made in FY2010  
1<sup>st</sup> campaigns started in FY2011**

## Carbon Air Quality Research Aircraft Vulnerability Experiment (CARVE) - JPL

This investigation will collect an integrated set of data that will provide unprecedented experimental insight into carbon cycling, especially the release of the important greenhouse gases such as carbon dioxide and methane. Instruments will be flown on a Twin Otter aircraft to produce the first simultaneous measurements of surface characteristics that



## Deriving Information on Surface Conditions from Column and Vertically

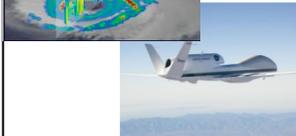
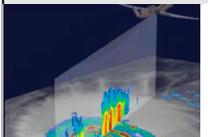
## Resolved Observations Relevant to Air Quality (DISCOVER-AQ) - LaRC

The overarching objective of the DISCOVER-AQ investigation is to improve the interpretation of satellite observations to diagnose near-surface conditions relating to air quality. NASA's B-200 and P-3B research aircraft will fly together to sample a column of the atmosphere over instrumented ground stations.



## Hurricane and Severe Storm Sentinel (HS3) - GSFC/ARC

The prediction of the intensity of hurricanes is not as reliable as predictions of the location of hurricane landfall, in large part because of our poor understanding of the processes involved in intensity change. This investigation focuses on studying hurricanes in the Atlantic Ocean basin using two NASA Global Hawks flying high above the storms for up to 30 hours. The Hawks will deploy from NASA's Wallops Flight Facility in Virginia during the 2012-14 Atlantic hurricane seasons.



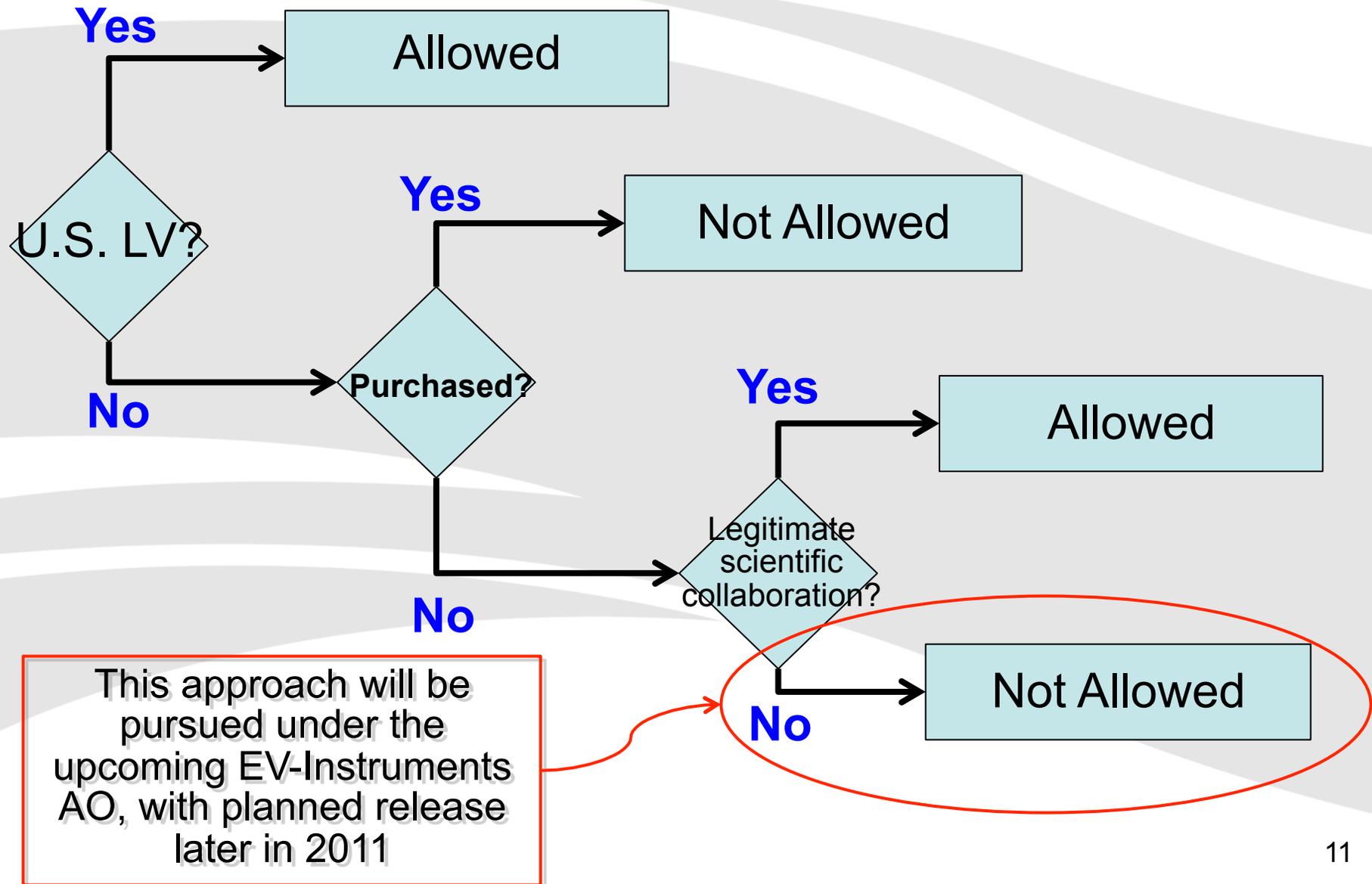
# EV-2 Opens Up Multiple Mission Possibilities



- ◆ Small missions with either NASA-provided Launch Services or with non-NASA provided but US-manufactured launch services
- ◆ Stand-alone investigations aboard the International Space Station
- ◆ Stand-alone hosted payloads on partner or contributed missions with foreign launch services if it is part of a scientific collaboration
- ◆ Stand-alone hosted payloads on commercial satellites, if flown on a US-provided launch vehicle

**AO Released in FY2011  
Selection(s) to be made in FY2012**

# Summary of Launch Vehicle Options



# EV-Instruments (EV-I) Plans



- ◆ The third leg of the Venture-class investigations, or Earth Venture-Instruments (EV-I), will solicit proposals for a complete, principal investigator-led instrument to conduct innovative, integrated, hypothesis or scientific question-driven approach to pressing Earth system science issues
- ◆ Eventual hosts to be researched and provided by the NASA ESD

**1<sup>st</sup> AO Release planned for FY2011**  
**1<sup>st</sup> selection to be made in FY2012**  
**Repeated annually**

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