



# SCIENCE

## **Science Committee Report** Dr. Wes Huntress, Chair

# Science Committee Members

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Wes Huntress, Carnegie Institution, Chair

Byron Tapley, (Vice Chair) University of Texas-Austin, Chair of Earth Science

Brad Peterson, Ohio State, Chair of Astrophysics

Janet Luhmann, UC Berkeley, Chair of Planetary Science

Maura Hagan, NCAR, Chair of Heliophysics

Gene Levy, Rice University, Chair of Planetary Protection

Eugenia Kalnay, University of Maryland, Earth Science Member

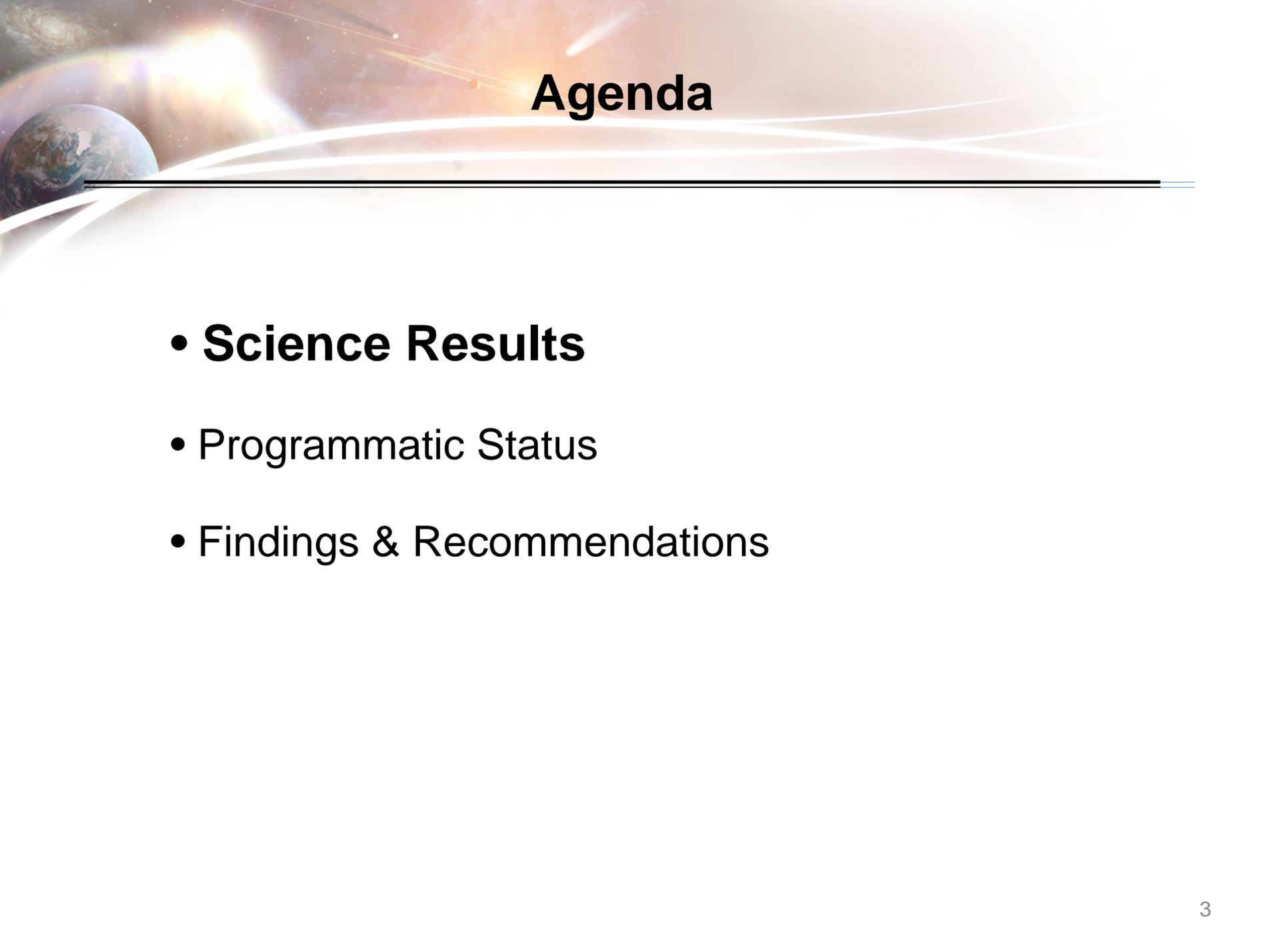
Meg Urry, Yale, Astrophysics member

(Vacant), Planetary Science member

Dave McComas, Southwest Research Institute, Heliophysics member

Noel Hinners, Independent Consultant

Charlie Kennel, Chair of Space Studies Board (*ex officio* member)



# Agenda

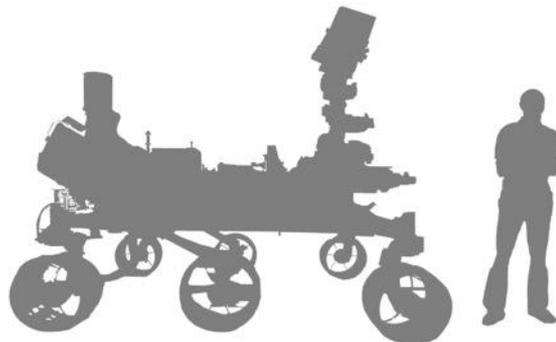
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- **Science Results**
- Programmatic Status
- Findings & Recommendations

# Curiosity – A Geochemical Lab for Mars



Nov 26, 2011



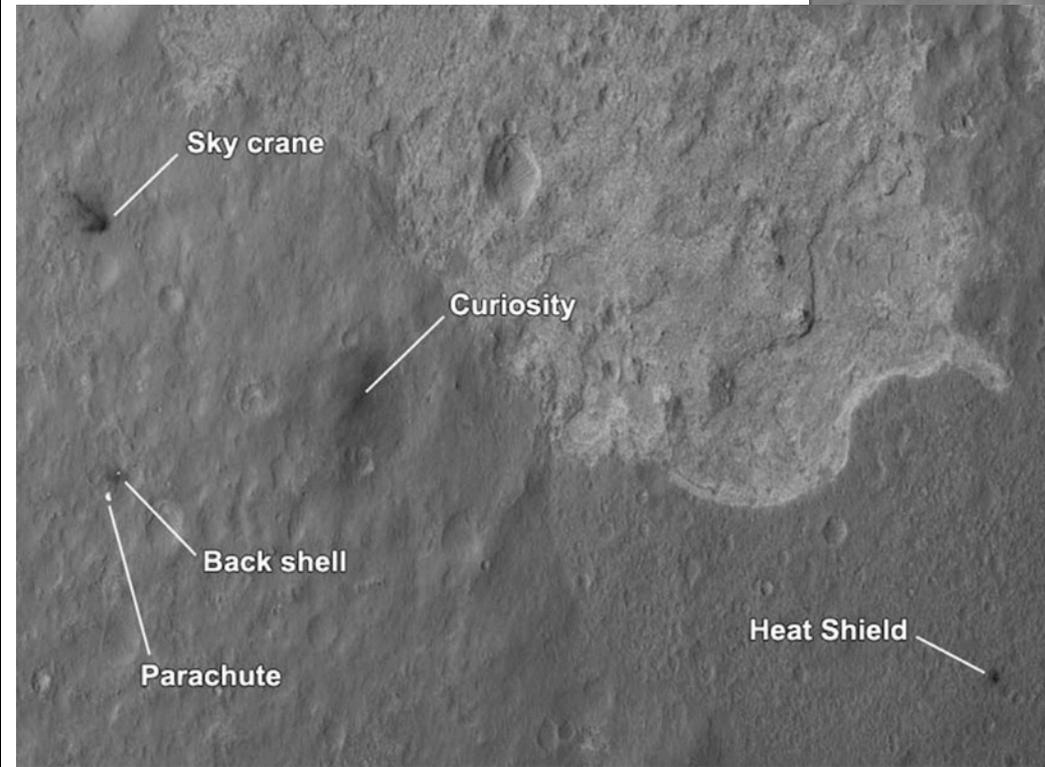
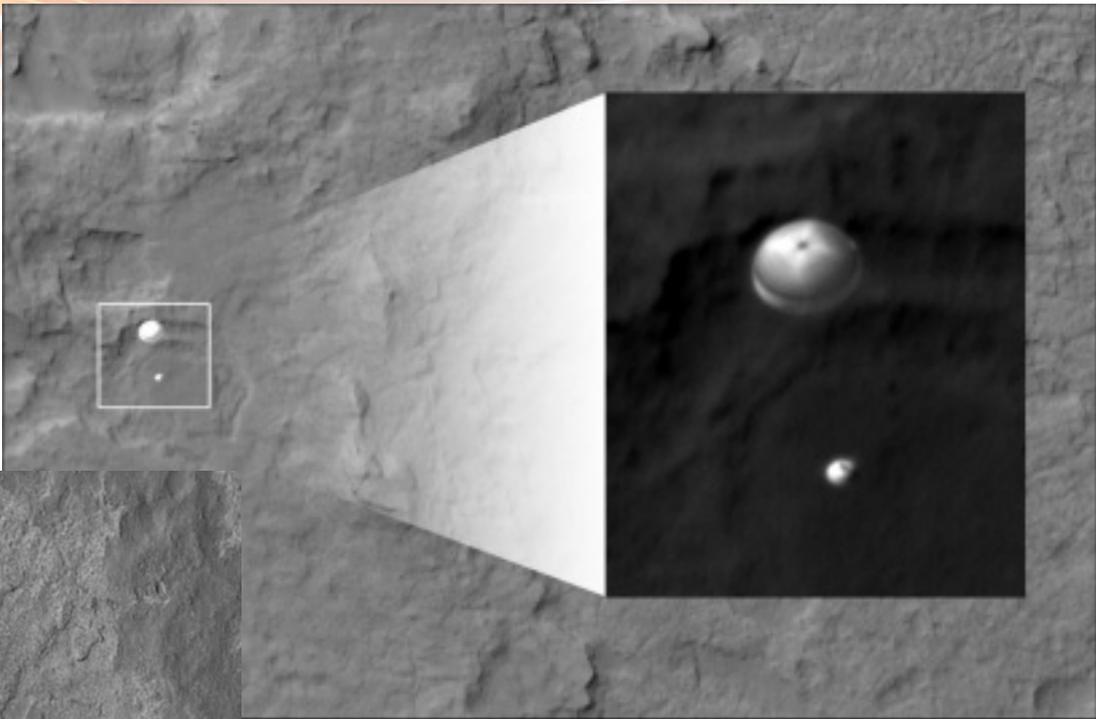
# Curiosity – Seven Minutes of Terror



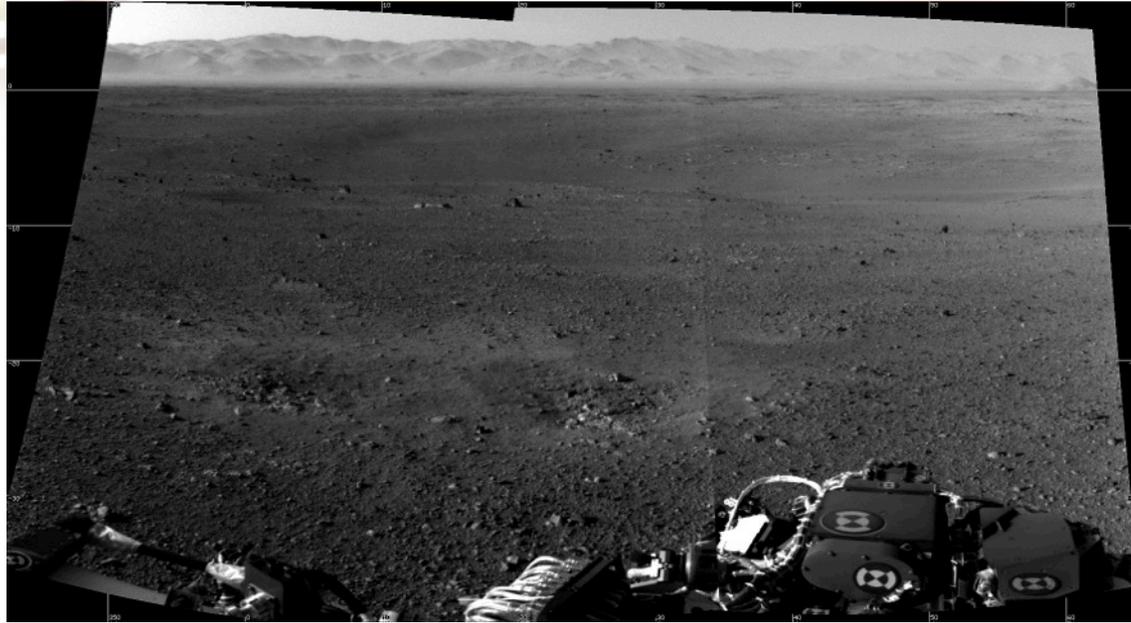
# Curiosity – Anxiety & Elation



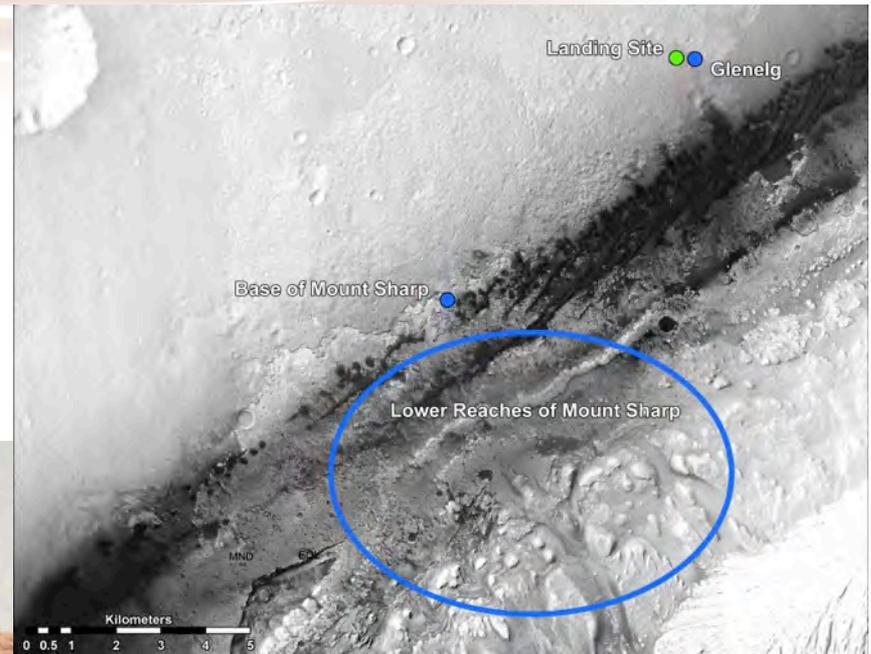
# Curiosity – View from Orbit



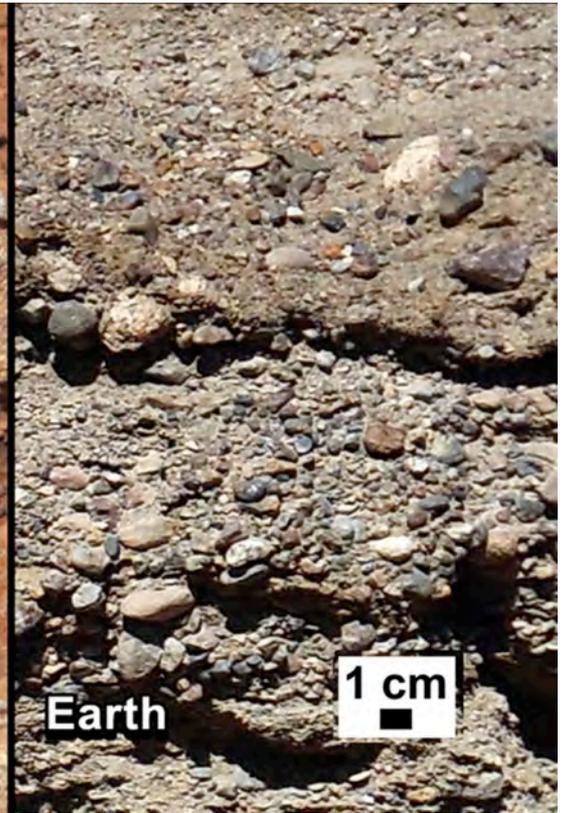
# Curiosity – Safe on Mars



# Curiosity – Where to go?



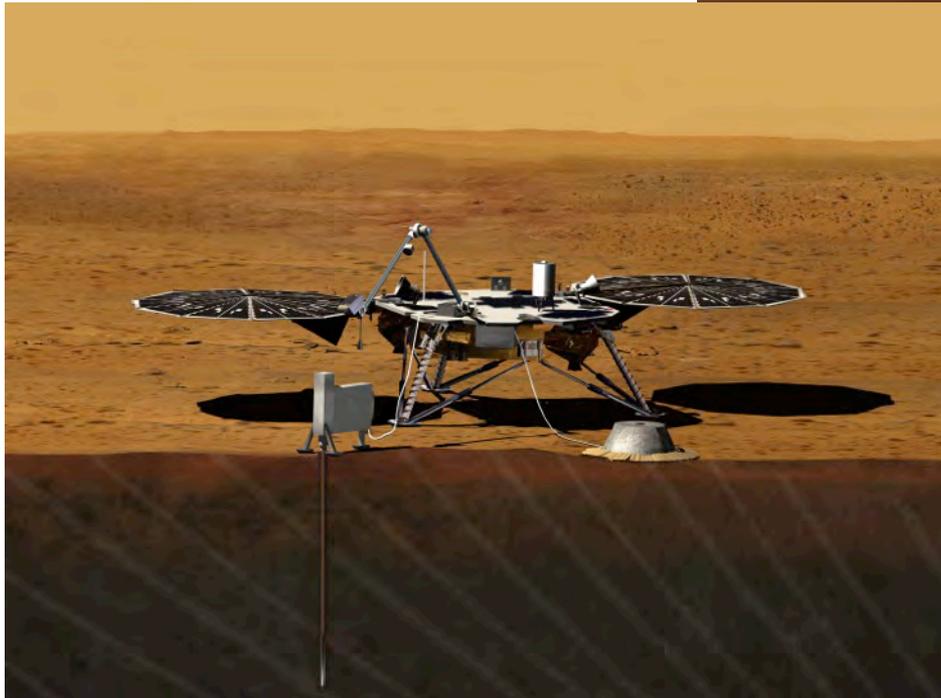
# Curiosity – Landed in an ancient river bed!



Watch this space!

# Mars – what's next?

MAVEN Late Nov 2013



InSight 2016



# • Summary of the Final Report

- 14 November 2012

Presented by:  
*Dr. James Garvin*  
on behalf of  
*Chairman O. Figueroa*

## MPPG

Mars Program Planning Group



# Successful RBSP Launch On August 30, 2012

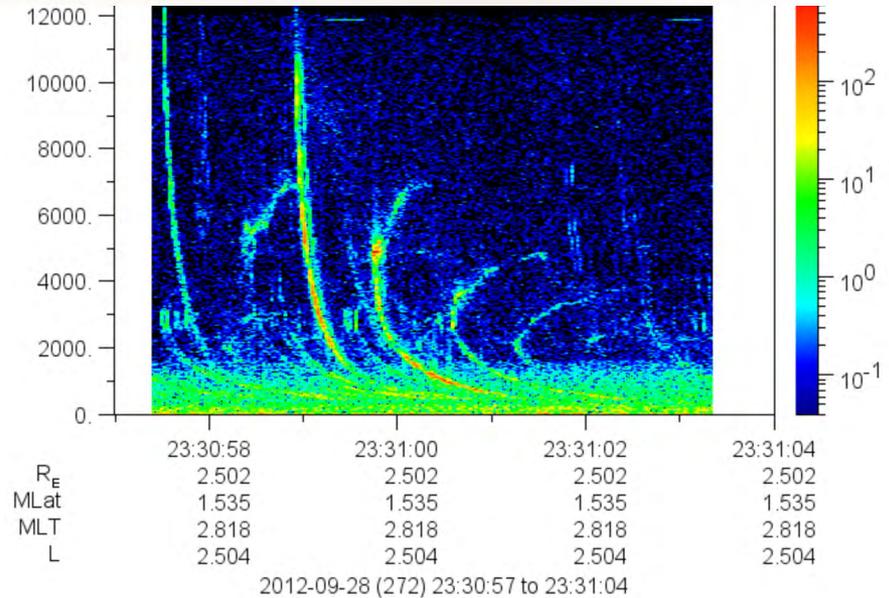
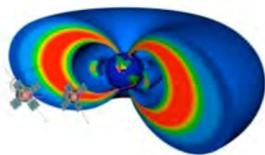


Renamed the Van Allen Probes  
Two coordinated spinner s/c



# The Sounds of Space

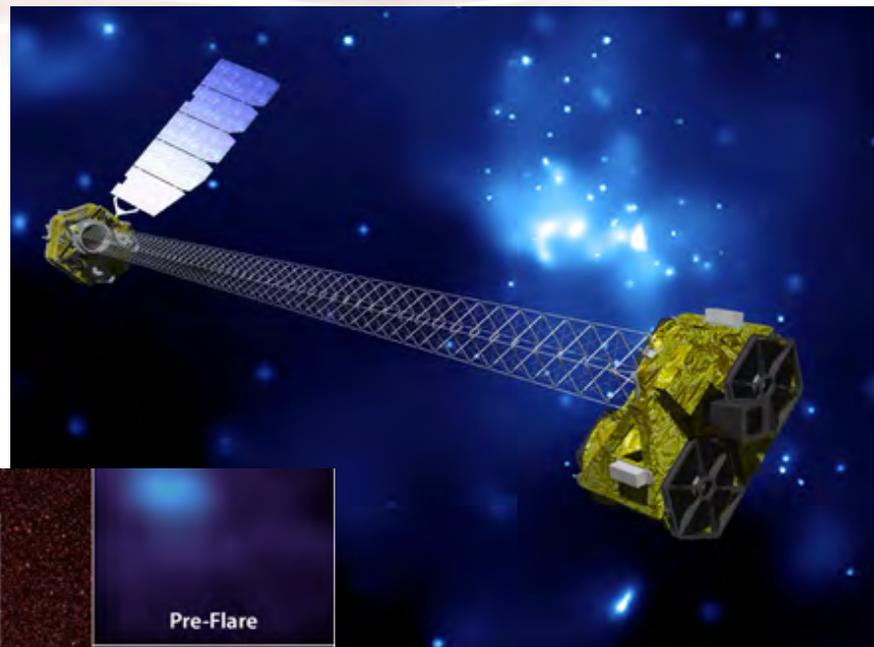
- Radio waves that are audible to the human ear are emitted by energetic particles in the Earth's magnetosphere
- People have known about the "chorus" for decades
- Radio receivers pick the chorus up, often more easily in the morning
- It sounds a lot like birds chirping, which along with the morning occurrence is why it's sometimes referred to as the 'dawn chorus'.



**Wave-form burst captured from tri-axial search coil magnetometer and receiver**



# NuSTAR launched June 13



Infrared View of Milky Way

X-ray Image of Galactic Center

Pre-Flare

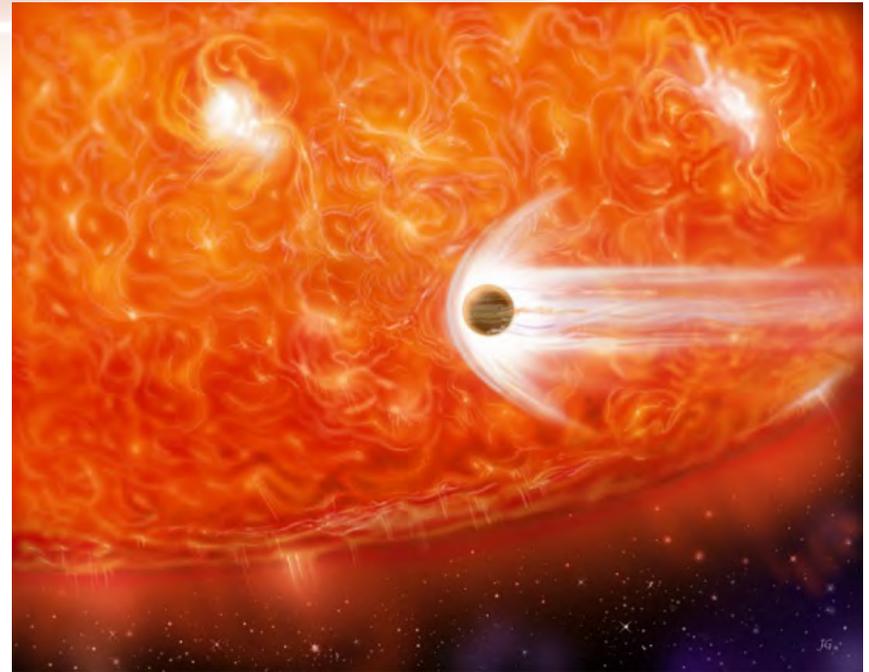
Flare

Post-Flare

# A star gobbles up a planet



McDonald Obs./UT-Austin

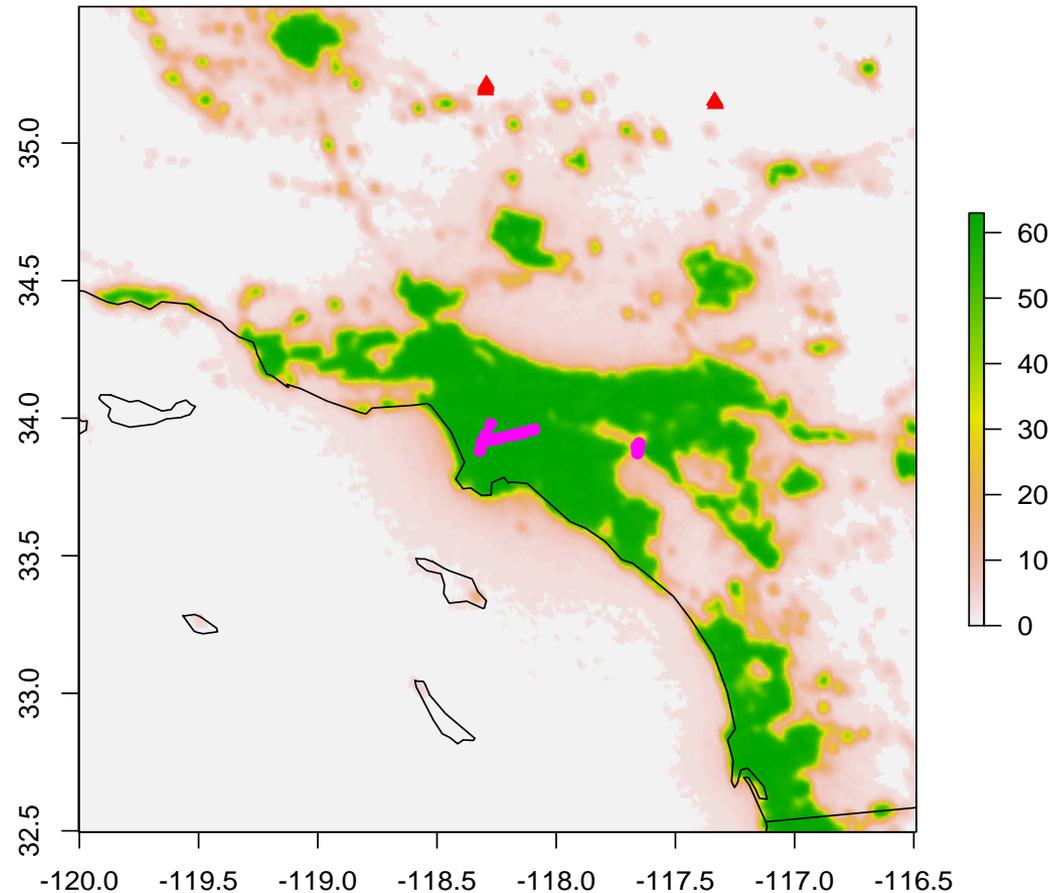


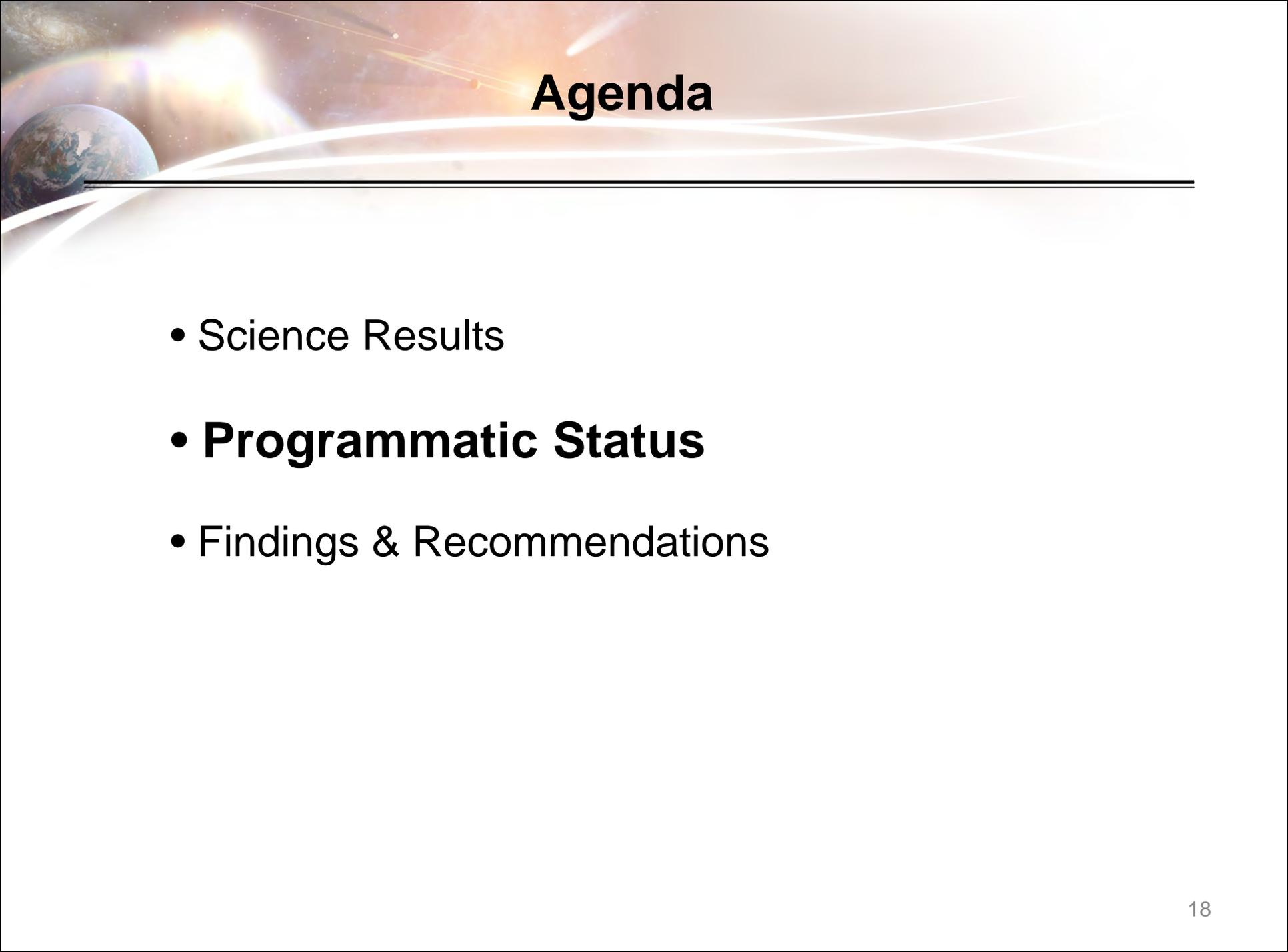
- Evidence of a planet having been devoured by a star while expanding into a red giant:
  - the star's peculiar chemical composition (Abnormally high Li); and
  - the highly unusual elliptical orbit of its surviving planet.

# Megacity Carbon Dioxide

Observations of CO<sub>2</sub> column enhancement from JAXA's GOSAT satellite by US Co-investigators from OCO

OCO-2 will significantly increase precision and spatial and temporal resolution.

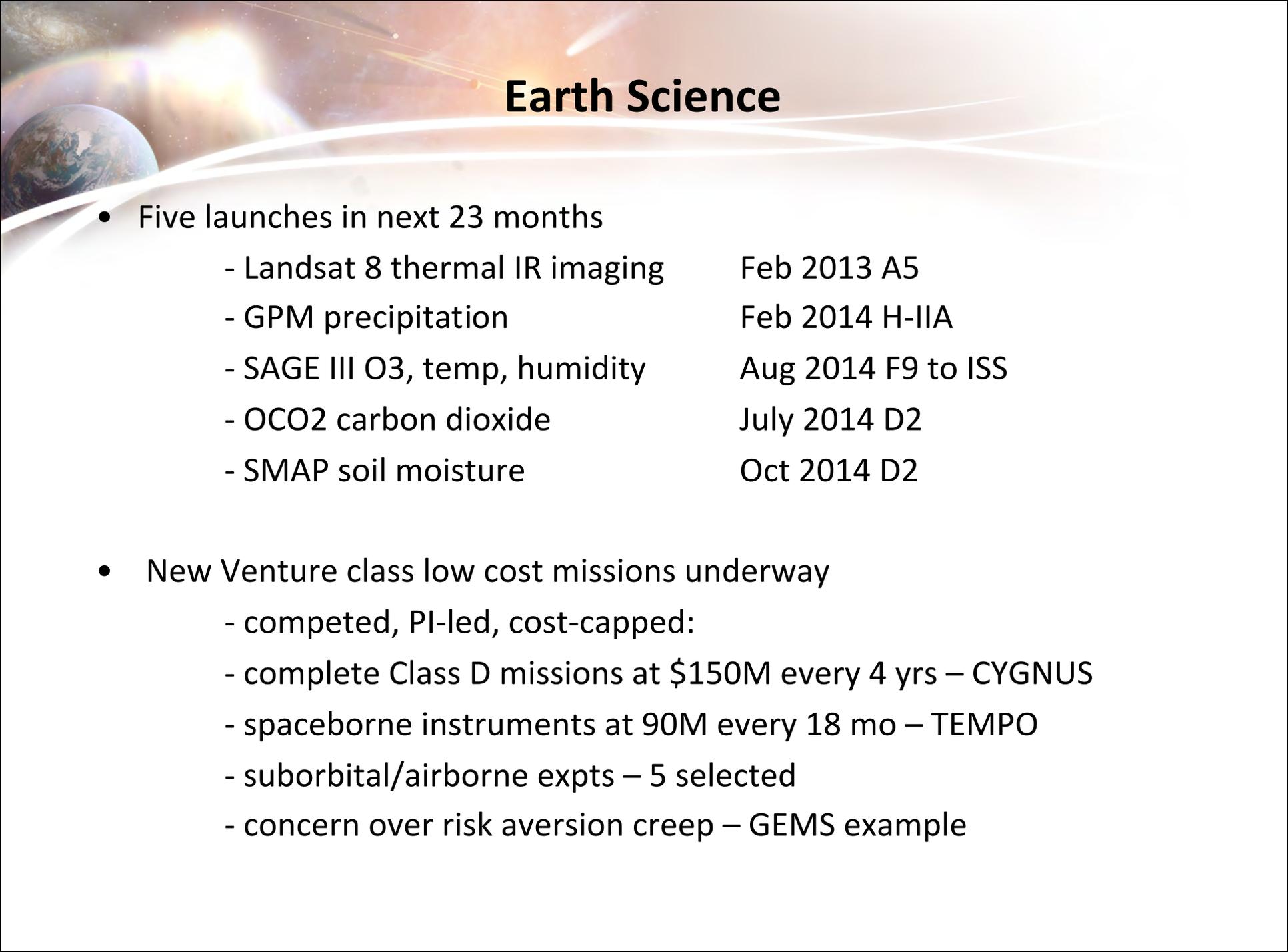




# Agenda

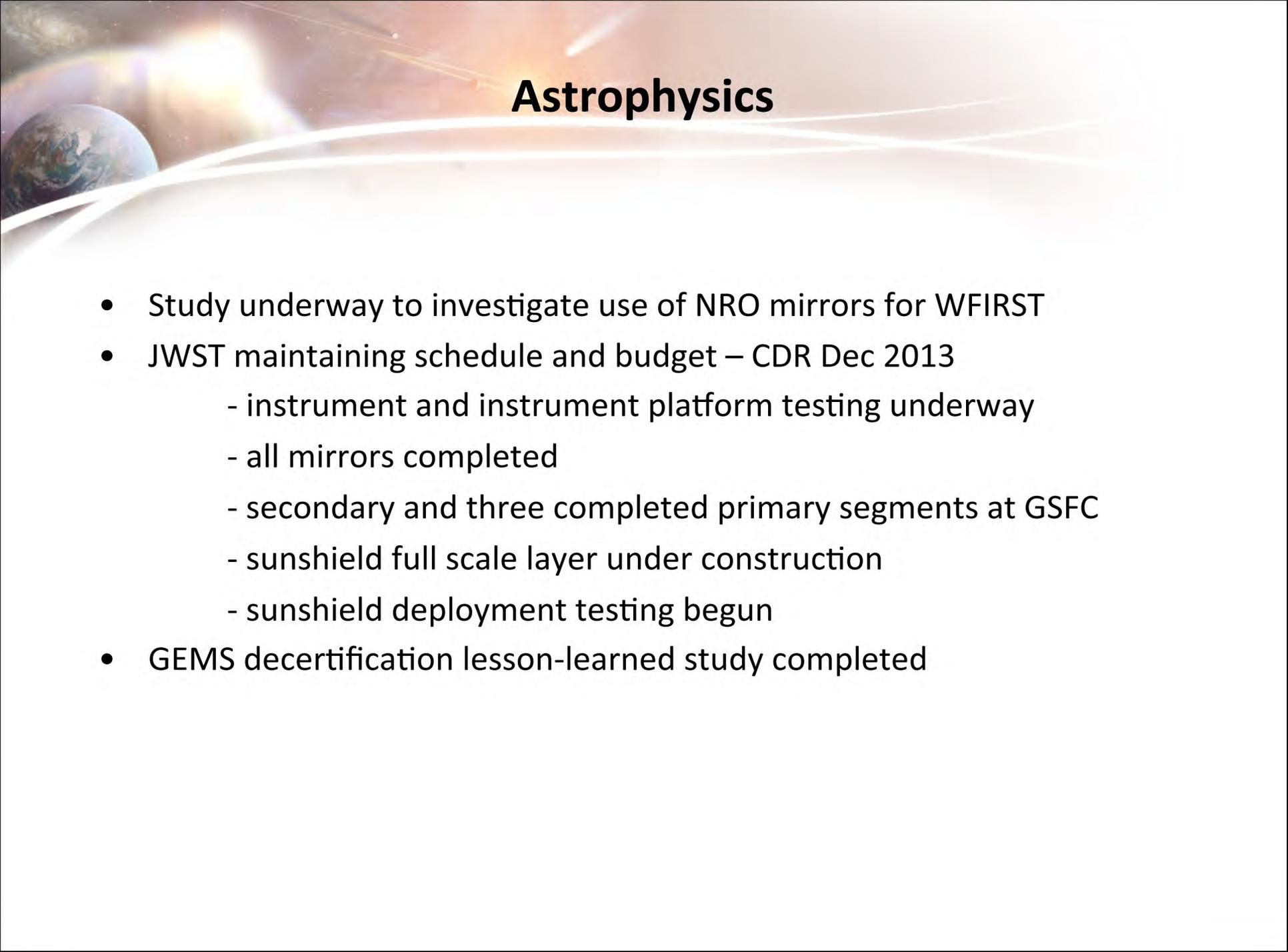
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# Earth Science

- Five launches in next 23 months
  - Landsat 8 thermal IR imaging Feb 2013 A5
  - GPM precipitation Feb 2014 H-IIA
  - SAGE III O3, temp, humidity Aug 2014 F9 to ISS
  - OCO2 carbon dioxide July 2014 D2
  - SMAP soil moisture Oct 2014 D2
- New Venture class low cost missions underway
  - competed, PI-led, cost-capped:
  - complete Class D missions at \$150M every 4 yrs – CYGNUS
  - spaceborne instruments at 90M every 18 mo – TEMPO
  - suborbital/airborne expts – 5 selected
  - concern over risk aversion creep – GEMS example

The background of the slide features a cosmic scene with a bright star or galaxy core in the upper left, a comet streaking across the sky, and a view of Earth from space on the left side. The title 'Astrophysics' is centered at the top in a bold, black font.

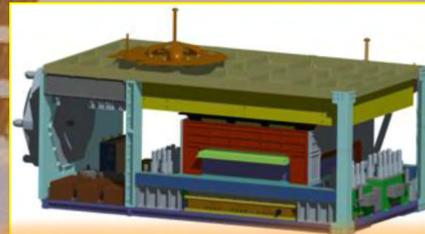
# Astrophysics

- Study underway to investigate use of NRO mirrors for WFIRST
- JWST maintaining schedule and budget – CDR Dec 2013
  - instrument and instrument platform testing underway
  - all mirrors completed
  - secondary and three completed primary segments at GSFC
  - sunshield full scale layer under construction
  - sunshield deployment testing begun
- GEMS decertification lesson-learned study completed

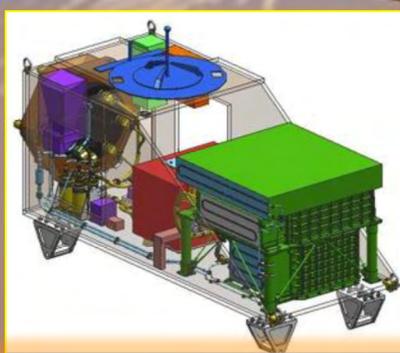
# Astrophysics on the ISS: A Cosmic-ray Observatory



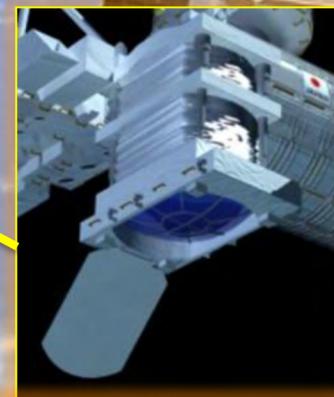
AMS Launch  
May 16, 2011



ISS-CREAM  
Sp-X Launch 2014



CALET on JEM  
HTV Launch 2014



JEM-EUSO  
Launch Tentatively  
planned for 2017



# heliophysics

## and the 2012 NRC Solar and Space Physics “Decadal Survey”

EMBARGO: Not for Public Release Before August 15, 2012 – 1PM EDT

### Solar and Space Physics: A Science for a Technological Society

**ADVANCE COPY**

NOT FOR PUBLIC RELEASE BEFORE

Wednesday, August 15, 2012

1:00 p.m. EDT

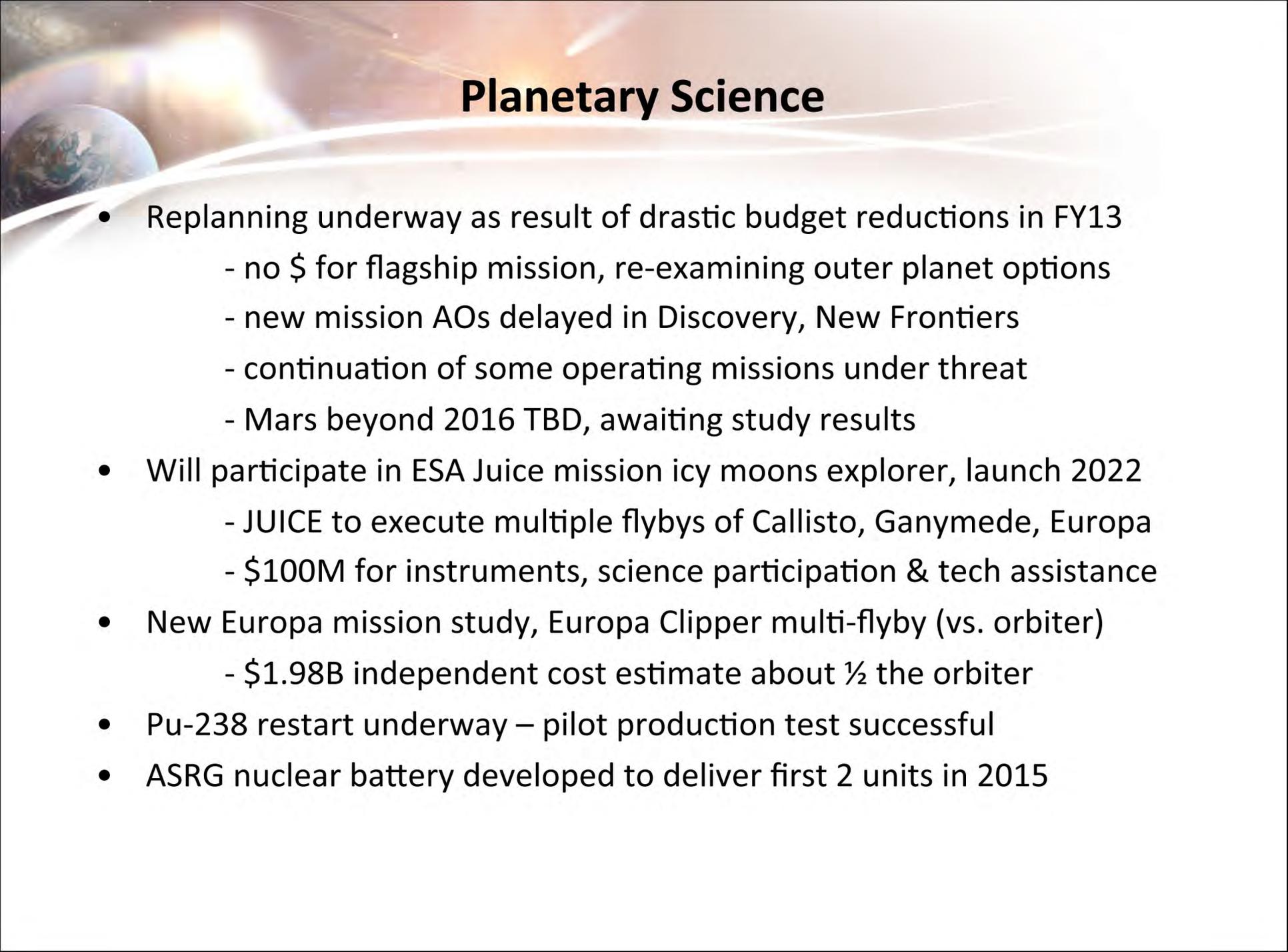
PLEASE CITE AS A REPORT OF THE  
NATIONAL RESEARCH COUNCIL

Committee on a Decadal Strategy for Solar and Space Physics (Heliophysics)  
Space Studies Board  
Aeronautics and Space Engineering Board  
Division on Engineering and Physical Sciences  
NATIONAL RESEARCH COUNCIL  
OF THE NATIONAL ACADEMIES

THE NATIONAL ACADEMIES PRESS  
Washington, D.C.  
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PREPUBLICATION COPY—SUBJECT TO FURTHER EDITORIAL CORRECTION

- Left: NRC Report: Solar and Space Physics: A Science for a Technological Society
- Released Aug. 15, 2012



# Planetary Science

- Replanning underway as result of drastic budget reductions in FY13
  - no \$ for flagship mission, re-examining outer planet options
  - new mission AOs delayed in Discovery, New Frontiers
  - continuation of some operating missions under threat
  - Mars beyond 2016 TBD, awaiting study results
- Will participate in ESA Juice mission icy moons explorer, launch 2022
  - JUICE to execute multiple flybys of Callisto, Ganymede, Europa
  - \$100M for instruments, science participation & tech assistance
- New Europa mission study, Europa Clipper multi-flyby (vs. orbiter)
  - \$1.98B independent cost estimate about ½ the orbiter
- Pu-238 restart underway – pilot production test successful
- ASRG nuclear battery developed to deliver first 2 units in 2015



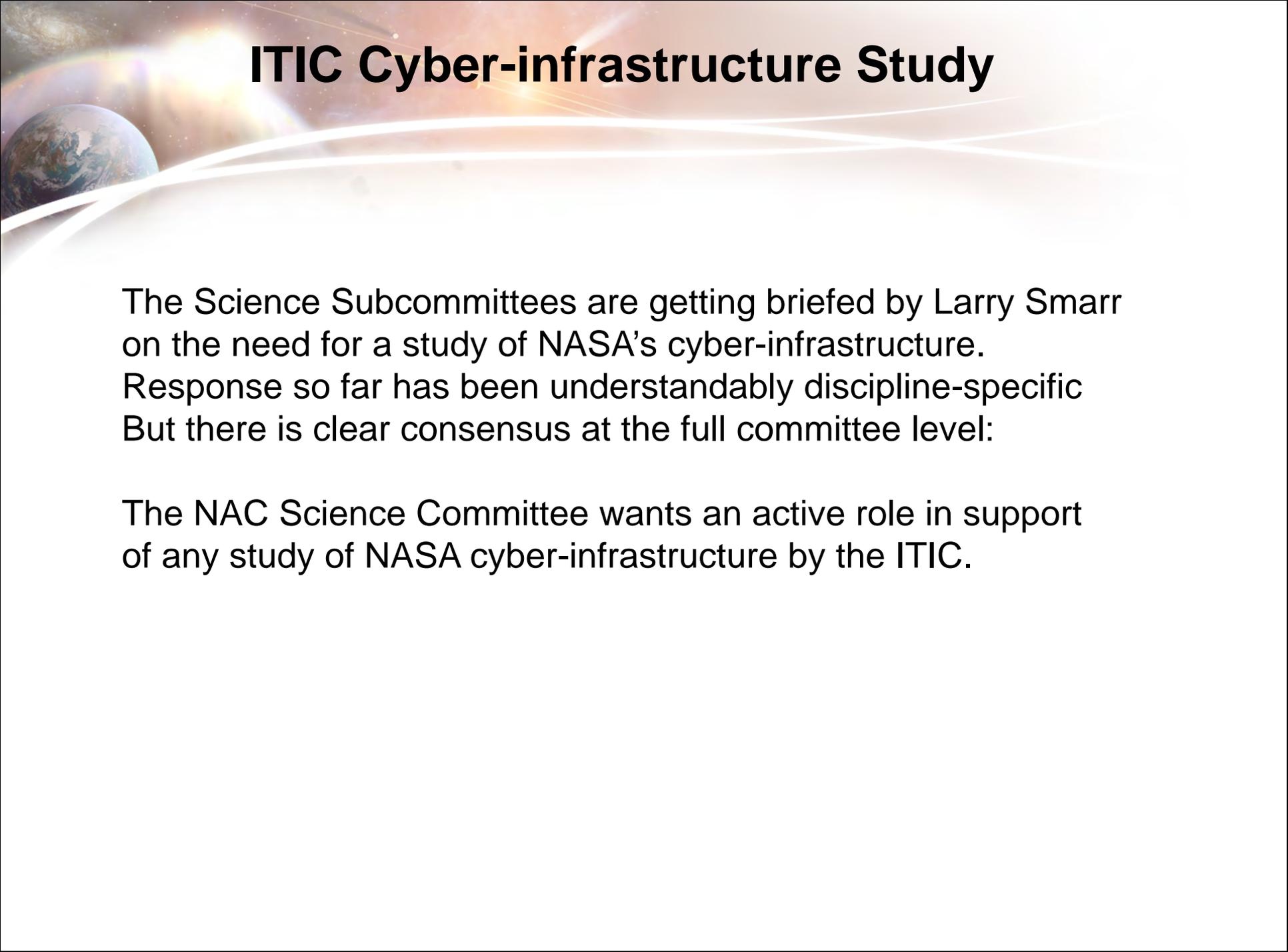
# Agenda

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# A Concern about SMD staff reductions

- 35% reduction in staff since 2004 (NASA 3%, NASA HQ 12%)
- Some functions transferred but far more have been added
  - new content incl Joint Agency Satellite program
  - increased external requirements: more GAO & OIG investigations, OMB quarterly status, Congressional requirements
  - increased internal requirements: Monthly BPR, Joint Confidence Level Analyses, ad hoc studies, increased reporting via KDPs, DPMCs, and APMCs
- Demographics skewing the wrong way
  - SMD average age 53, 4 yrs higher than NASA average
  - 21% eligible for retirement, additional 28% for “early out”
  - only 8% under 40, only one under 30
- “Management by heroic effort is not sustainable”



# ITIC Cyber-infrastructure Study

The Science Subcommittees are getting briefed by Larry Smarr on the need for a study of NASA's cyber-infrastructure. Response so far has been understandably discipline-specific. But there is clear consensus at the full committee level:

The NAC Science Committee wants an active role in support of any study of NASA cyber-infrastructure by the ITIC.

# Recommendation

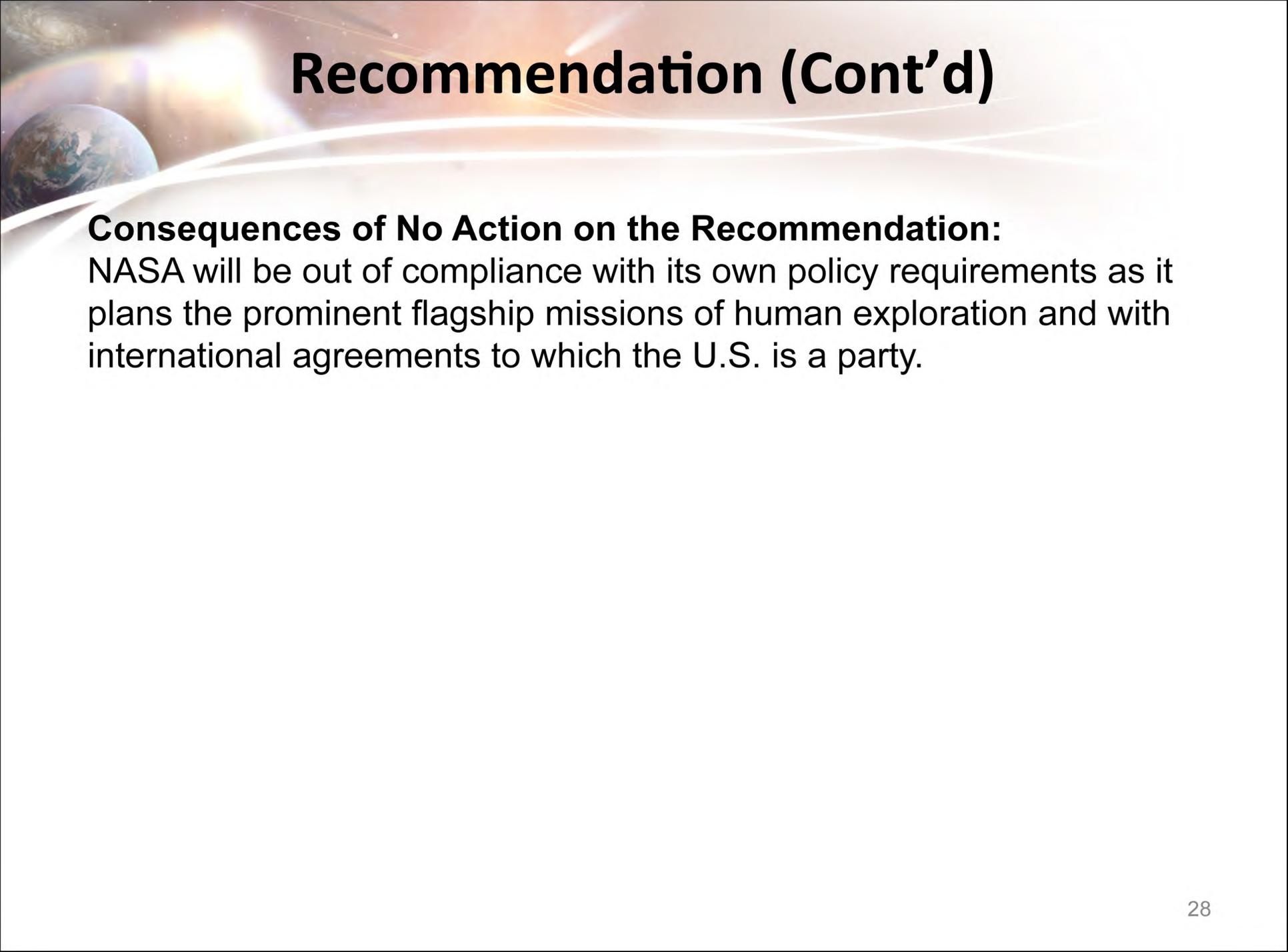
**Short Title:** Planetary Protection Procedural Requirements Document for Human Extraterrestrial Missions

## **Recommendation:**

The NAC recommends that NASA develop the appropriate implementing document to specify planetary protection procedural requirements for human extraterrestrial missions at a level corresponding to the current COSPAR (Committee on Space Research) planetary protection policy and adopt it as soon as practicable

## **Major Reasons for the Recommendation:**

NASA Policy Document 8020.7G on “Biological Contamination Control for Outbound and Inbound Planetary Spacecraft” requires the development of detailed documents delineating the standards and procedures implementing compliance with planetary protection standards and procedures for human spaceflight missions. Currently, however, no such NASA documents exist for human missions.

The background of the slide features a space-themed image. On the left, a portion of the Earth is visible, showing blue oceans and white clouds. To the right, a bright, glowing light source, possibly the sun, creates a lens flare effect with rays of light extending across the top of the slide. The overall color palette is dominated by warm tones of orange, yellow, and white, with the blue of the Earth providing a contrast.

# Recommendation (Cont'd)

## **Consequences of No Action on the Recommendation:**

NASA will be out of compliance with its own policy requirements as it plans the prominent flagship missions of human exploration and with international agreements to which the U.S. is a party.