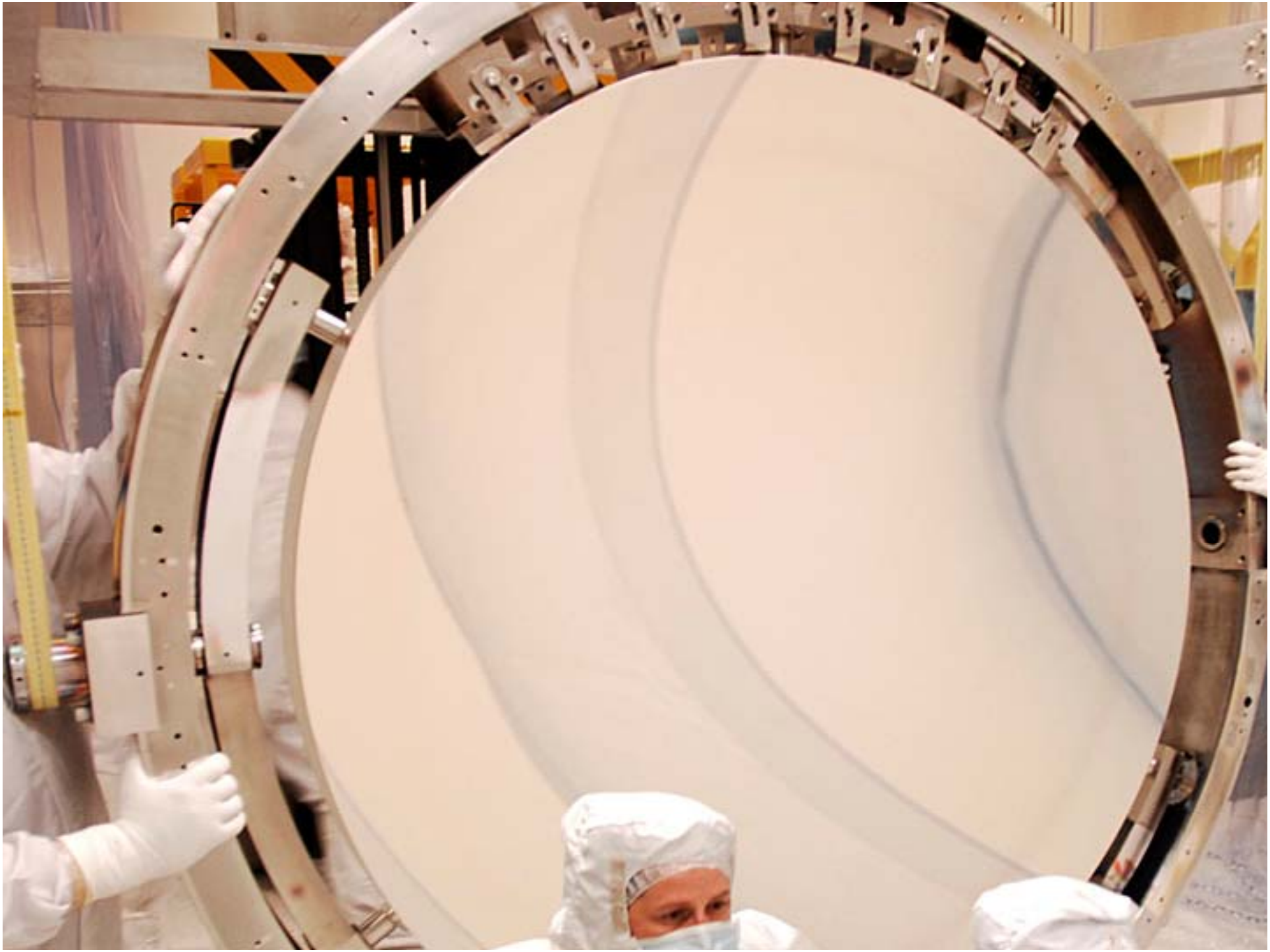
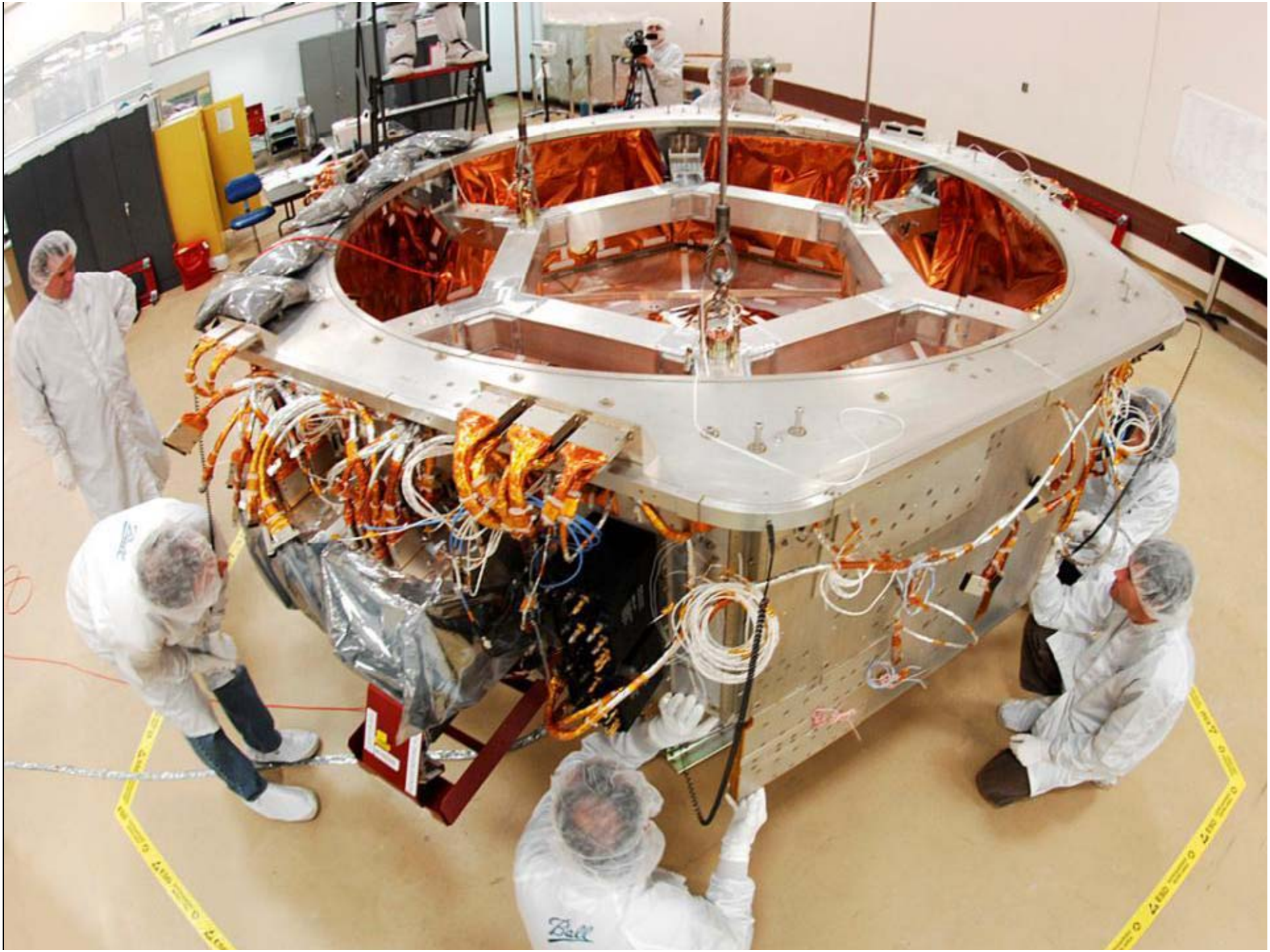
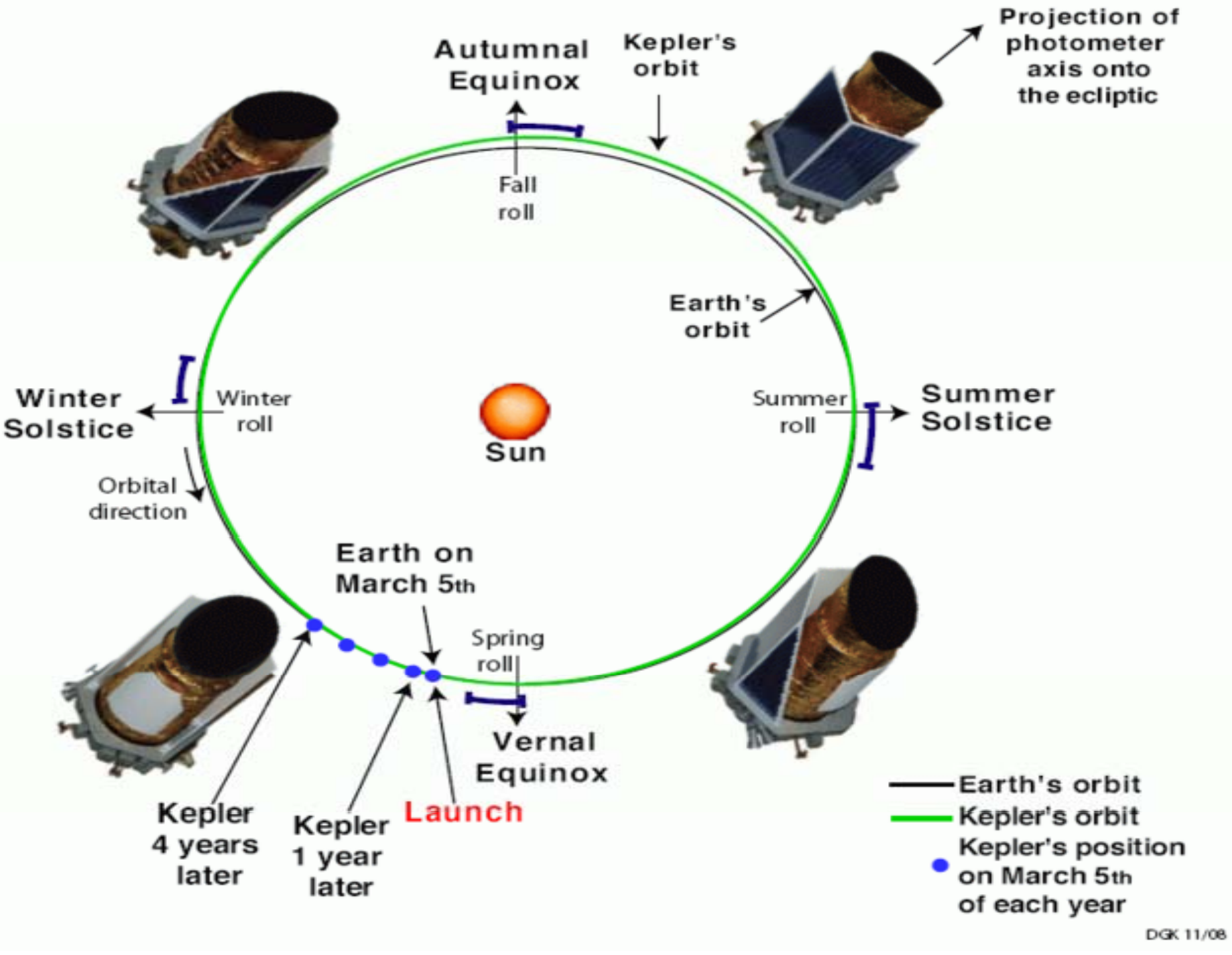
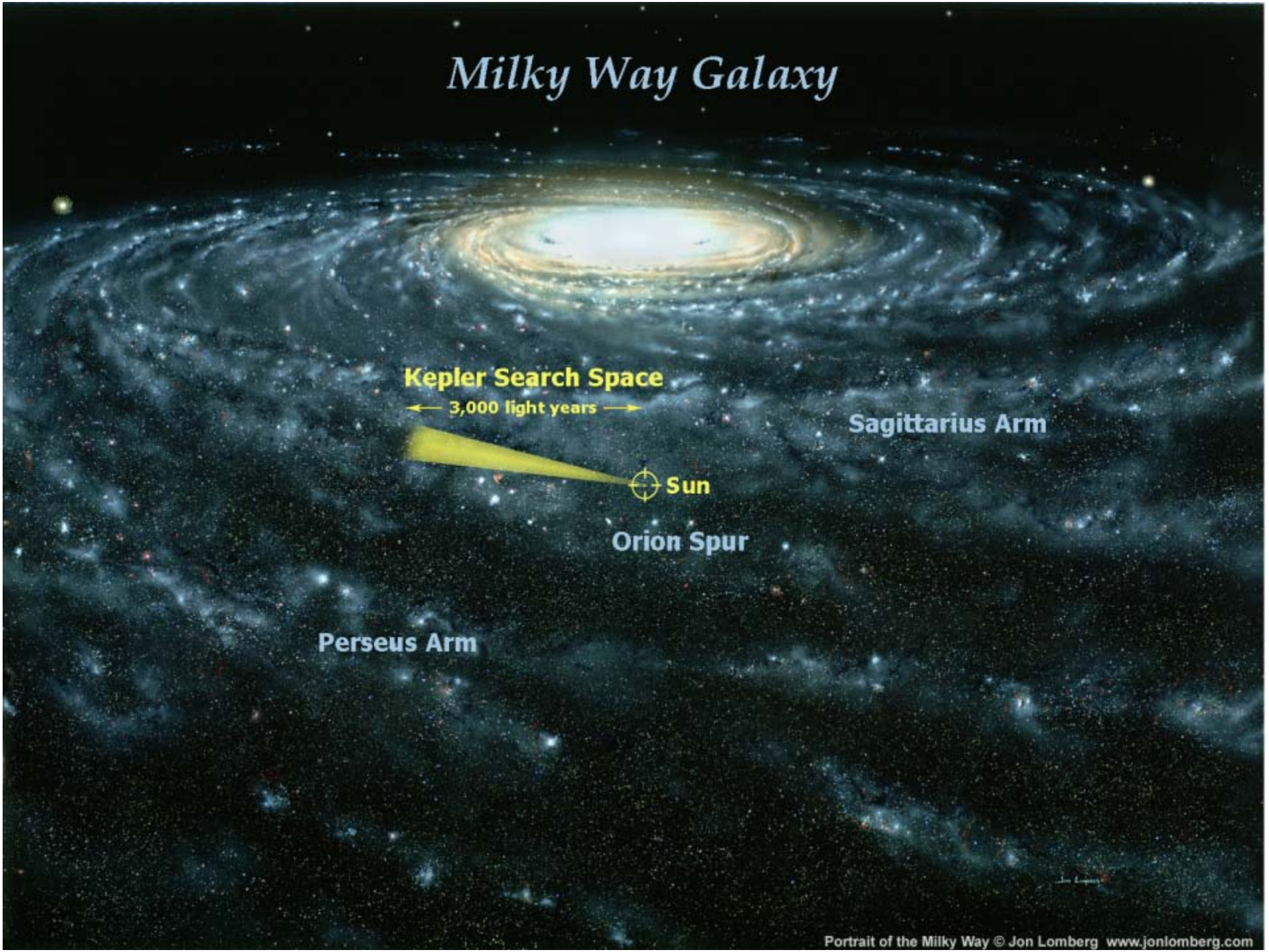
Pete Klupar

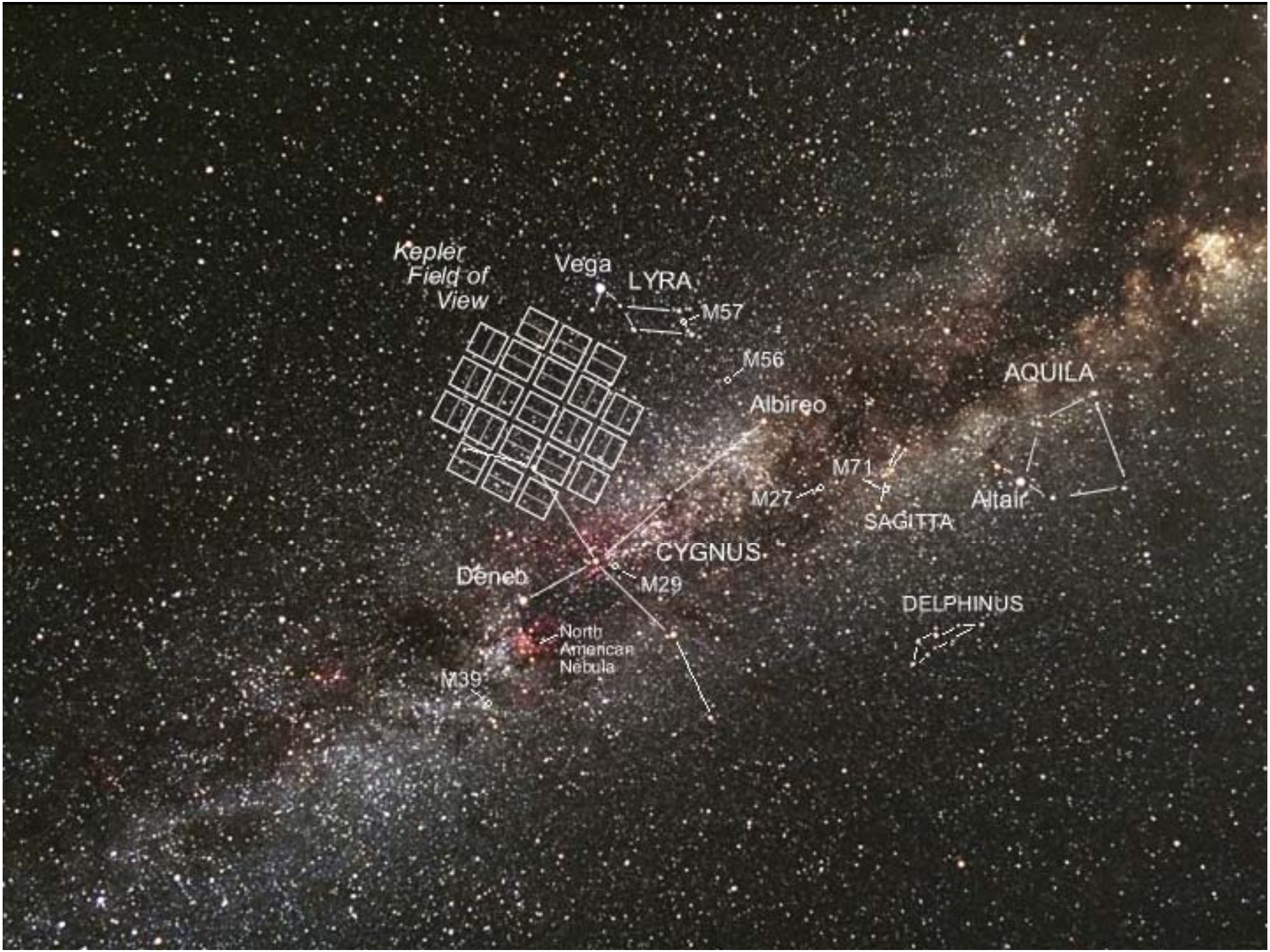
NASA Ames Research Center

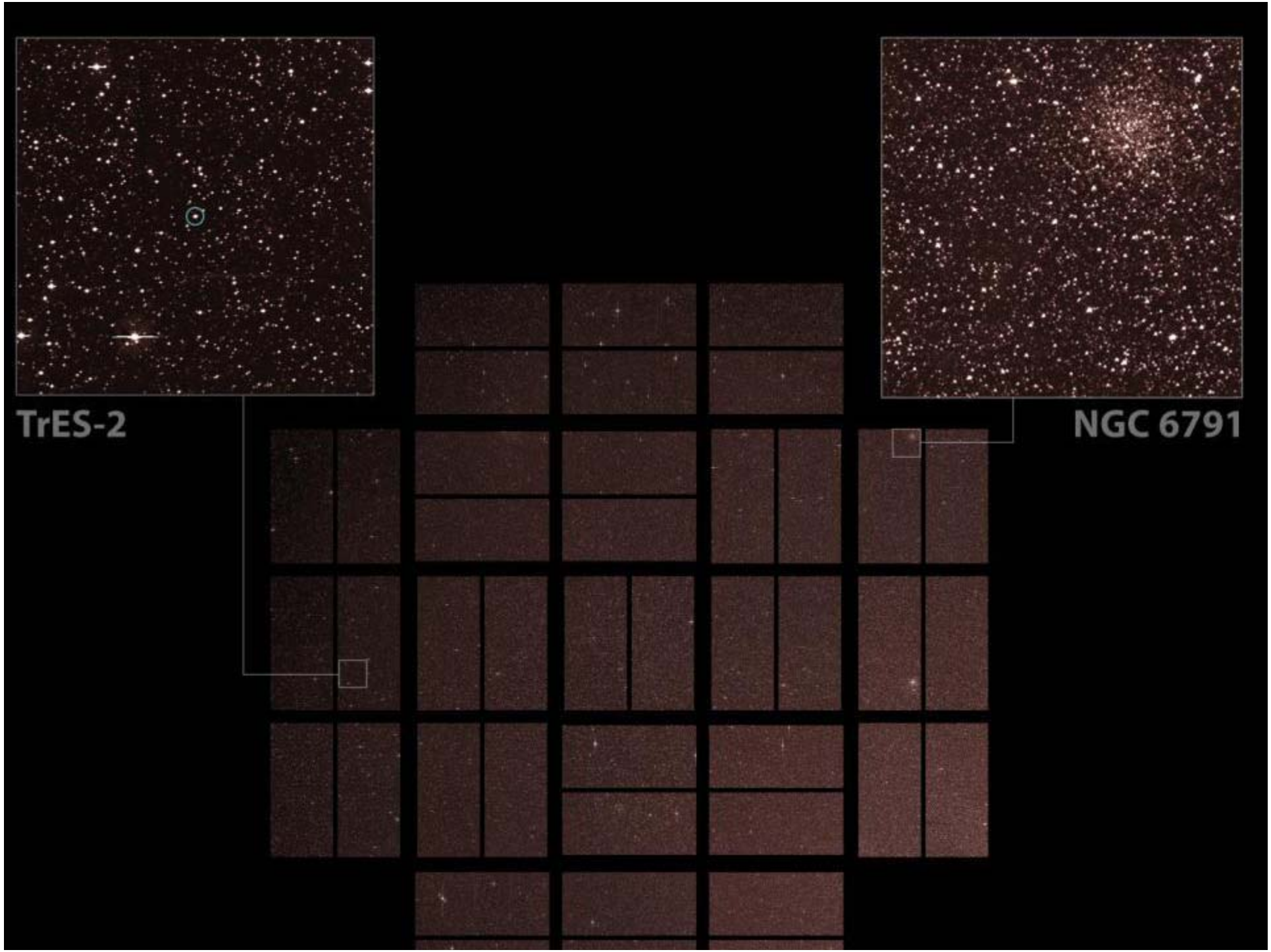


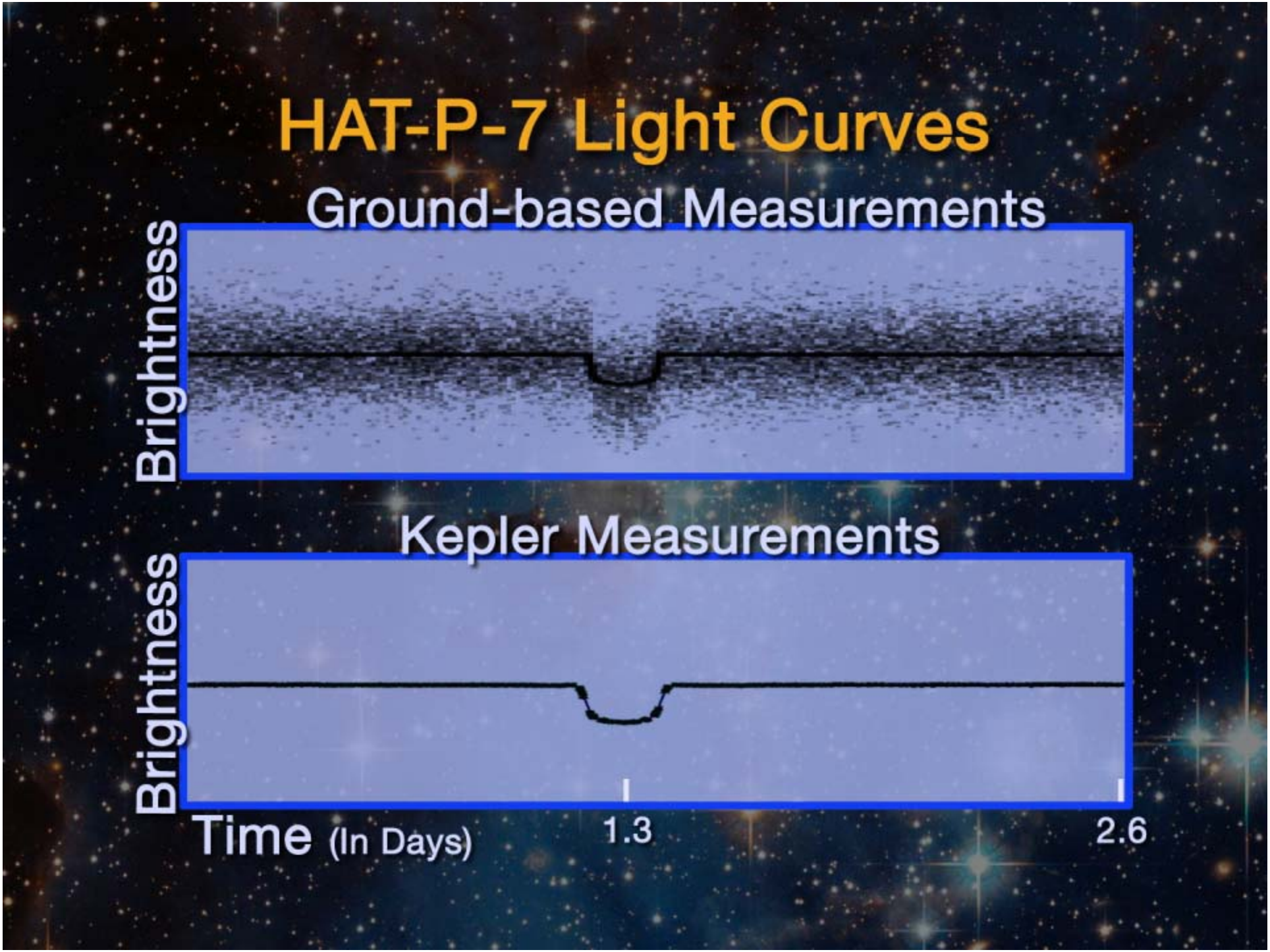



Autumnal Equinox
Kepler's orbit
Projection of photometer axis onto the ecliptic
Fall roll
Earth's orbit
Winter Solstice
Winter roll
Sun
Summer roll
Summer Solstice
Orbital direction
Earth on March 5th
Spring roll
Vernal Equinox
Kepler 4 years later
Kepler 1 year later
Launch
Earth's orbit
Kepler's orbit
Kepler's position on March 5th of each year
DGK 11/08

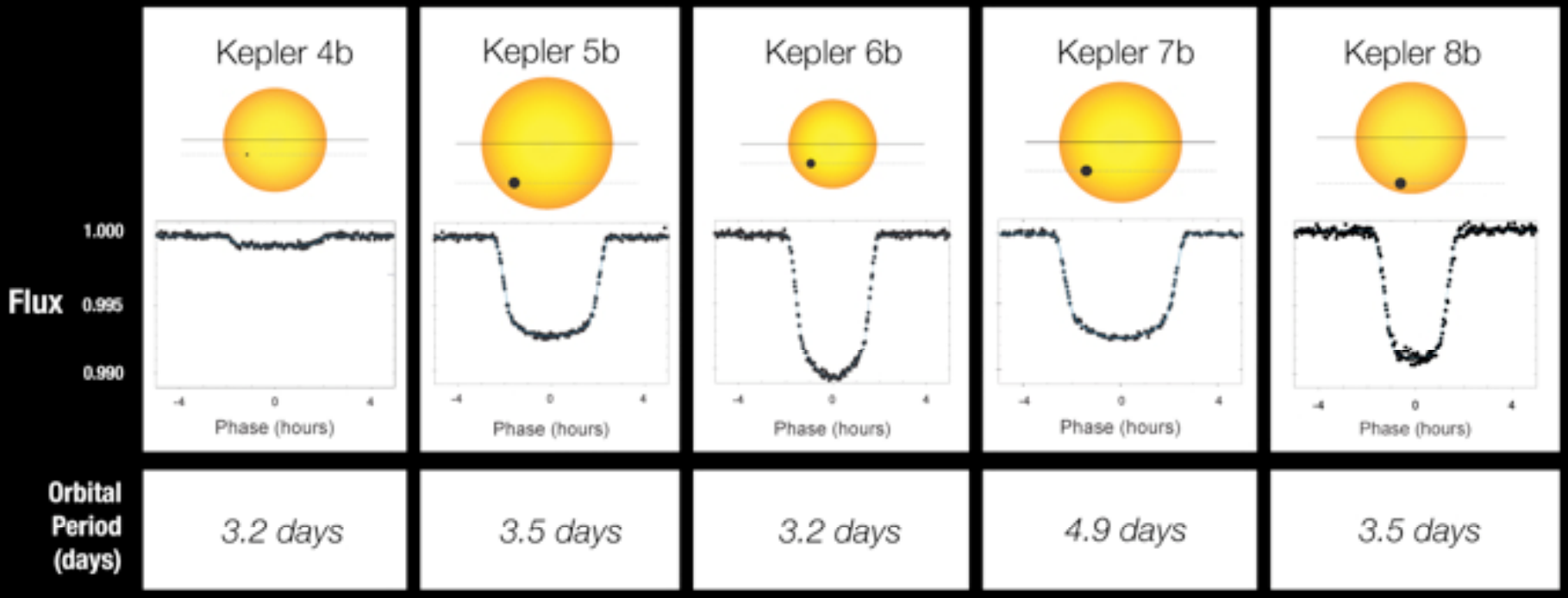

Milky Way Galaxy
Kepler Search Space
3,000 light years
Sagittarius Arm
Sun
Orion Spur
Perseus Arm
Portrait of the Milky Way © Jon Lomberg www.jonlomberg.com

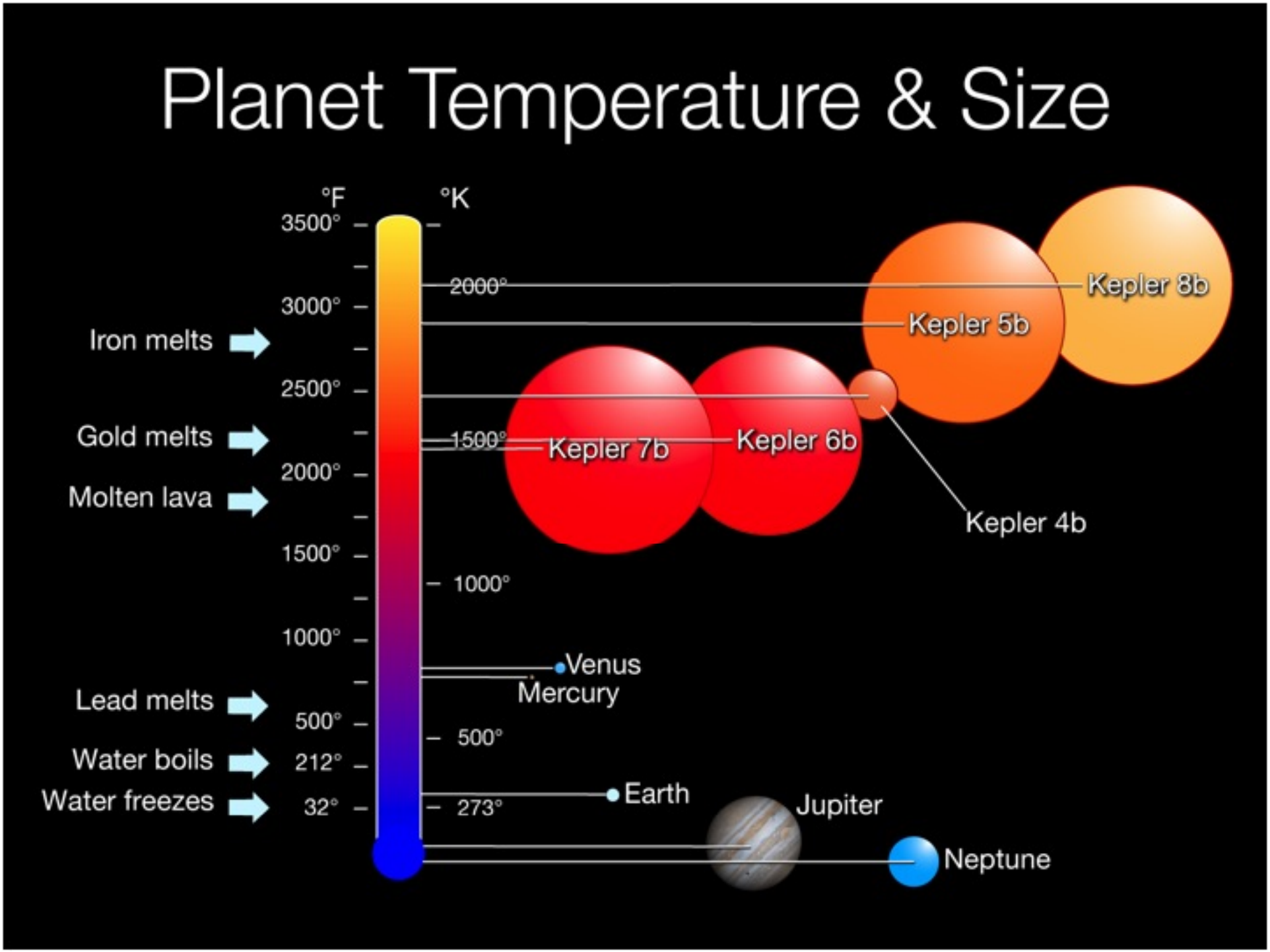

Kepler
Field of
View
Vega
LYRA
M57
M56
Albireo
AQUILA
M71
M27
SAGITTA
Altair
CYGNUS
Deneb
M29
DELPHINUS
North
American
Nebula
M39

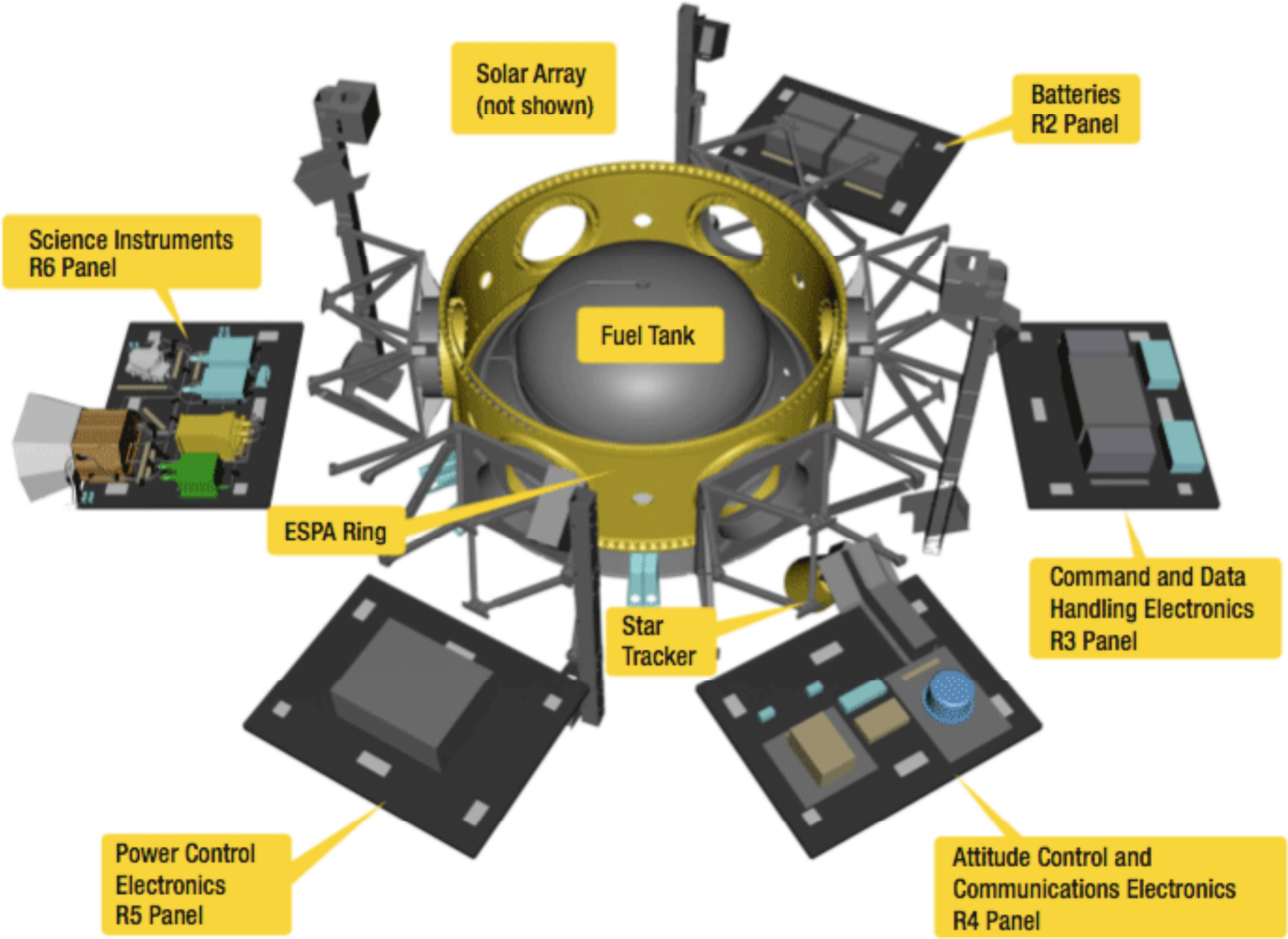

TrES-2
NGC 6791

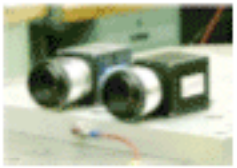
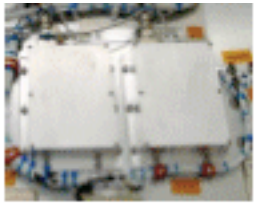

HAT-P-7 Light Curves
Ground-based Measurements
Brightness
Kepler Measurements
Brightness
Time (In Days)
1.3
2.6

Transit Light Curves

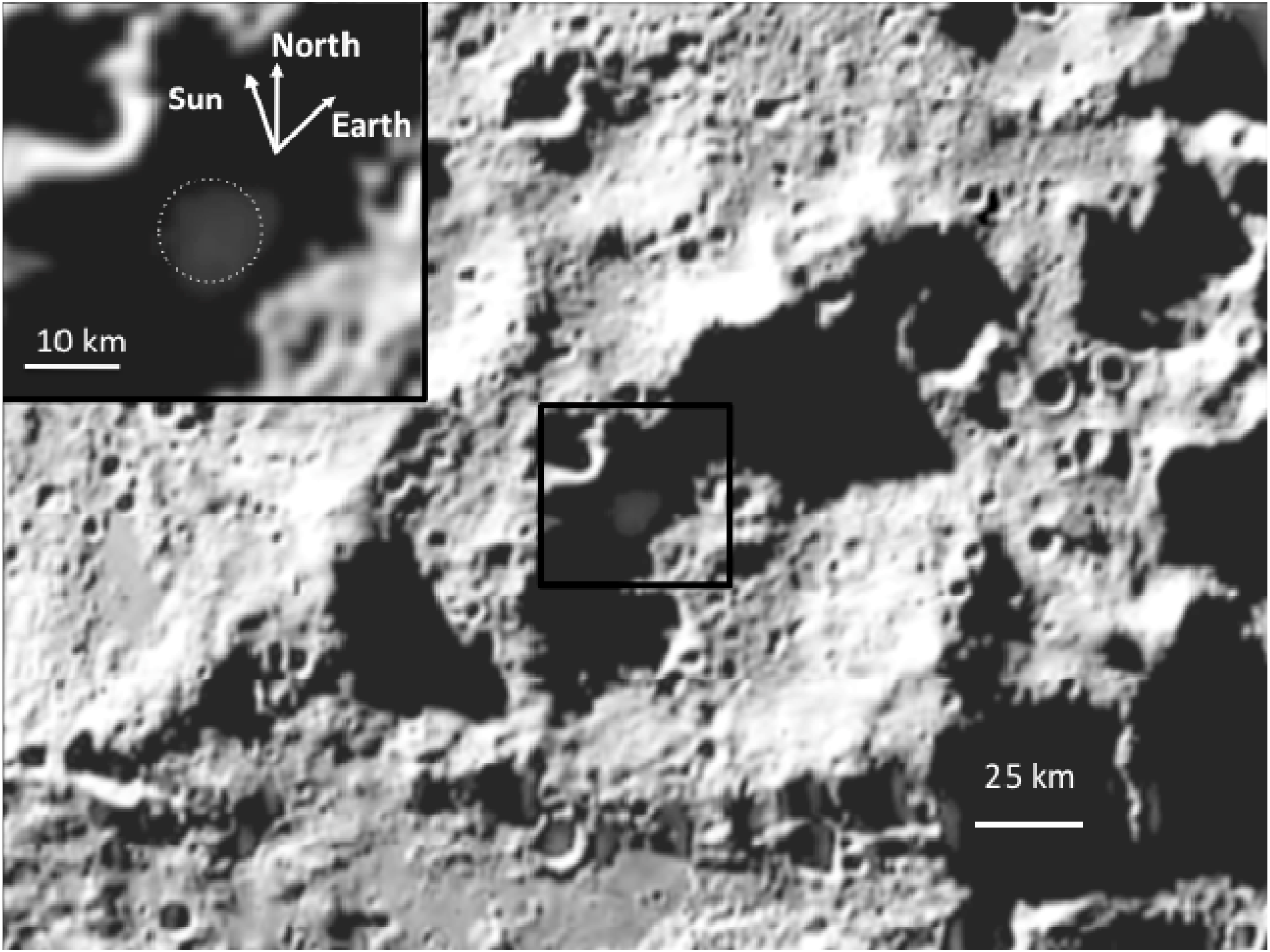


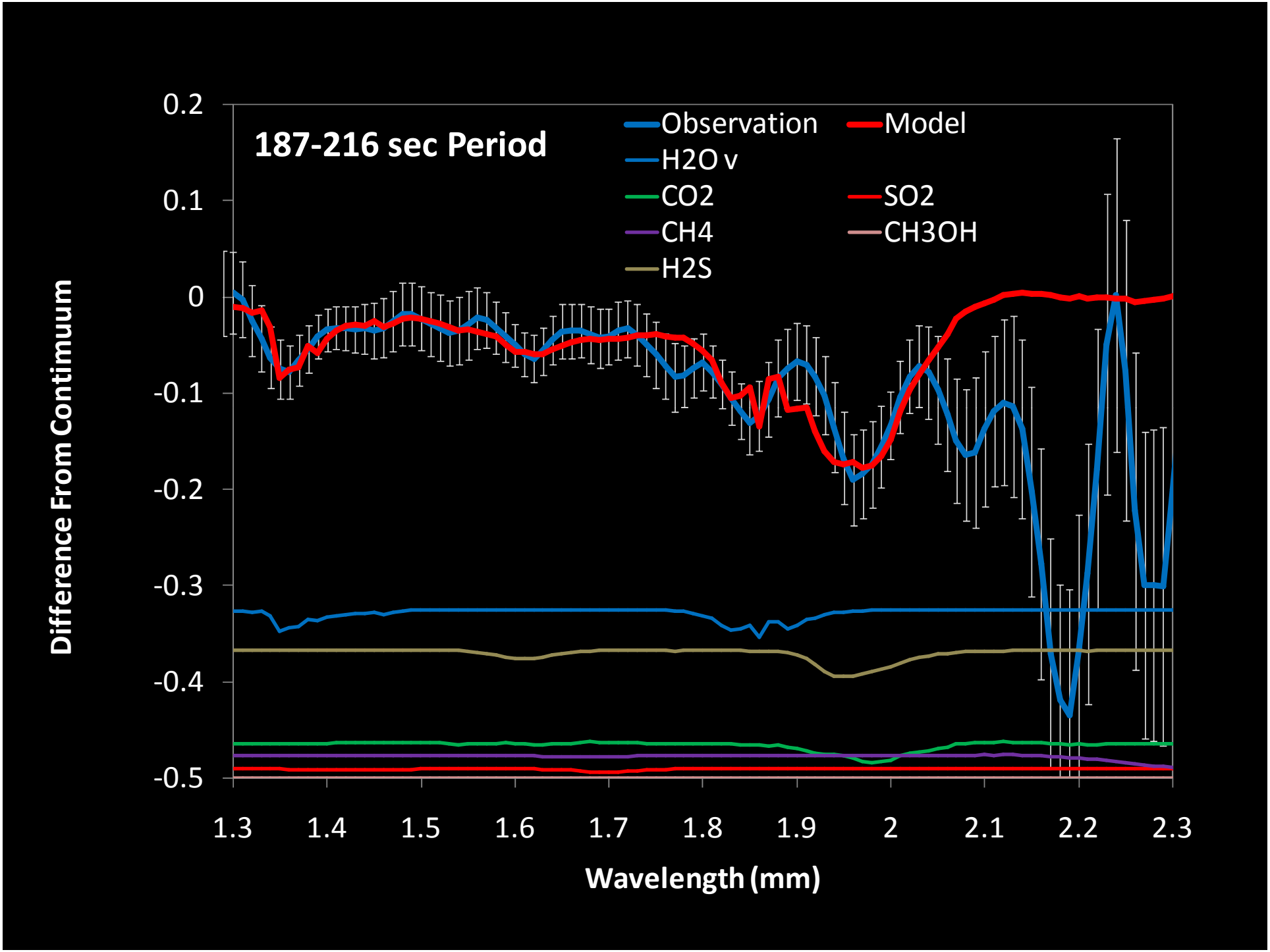

Planet Temperature & Size
°F
°K
3500°
3000°
2500°
2000°
1500°
1000°
500°
212°
32°
2000°
1500°
1000°
500°
273°
Iron melts
Gold melts
Molten lava
Lead melts
Water boils
Water freezes
Kepler 8b
Kepler 5b
Kepler 7b
Kepler 6b
Kepler 4b
Venus
Mercury
Earth
Jupiter
Neptune


Solar Array
(not shown)
Batteries
R2 Panel
Science Instruments
R6 Panel
Fuel Tank
ESPA Ring
Command and Data
Handling Electronics
R3 Panel
Star
Tracker
Power Control
Electronics
R5 Panel
Attitude Control and
Communications Electronics
R4 Panel

LCROSS Payload Science Instrument		Sponsorship	Measurement
	Visible Camera (1 total)	Ecliptic Enterprises	• Visible context imagery • Monitor ejecta cloud morphology • Determine visible grain properties
	Near Infrared Cameras (2 total)	Goodrich Sensors Unlimited	• NIR (0.9–1.7 um) context imagery • Monitor ejecta cloud morphology • Determine NIR grain properties • Water concentration maps
	Mid-Infrared Cameras (2 total)	Thermoteknix (black case) Indigo (gold case)	• MIR (6.0–13.5 um) thermal image • Monitor the ejecta cloud morphology • Determine MIR grain properties • Measure thermal evolution of ejecta cl • Remnant crater imagery
	Visible Spectrometer (1 total)	Ocean Optics	• Visible (263–650 nm) emission and ref spectrometry of vapor plume, ejecta cl • Measure grain properties • Measure emission H2O vapor dissociat OH- (308 nm) and H2O+(619nm) fluore
	Near Infrared Spectrometers (2 total)	Polychromix	• NIR (1.2–2.4um) emission and reflecta spectrometry of vapor plume, ejecta cl • Measure grain properties • Measure broad H2O ice features • Occultation viewer to measure water v sorption by cloud particles
	Total Luminance Photometer (TLP) (1 total)	NASA Ames Research Center	• Measures total impact flash luminance (425–1,000 nm), magnitude, and decay luminance curve

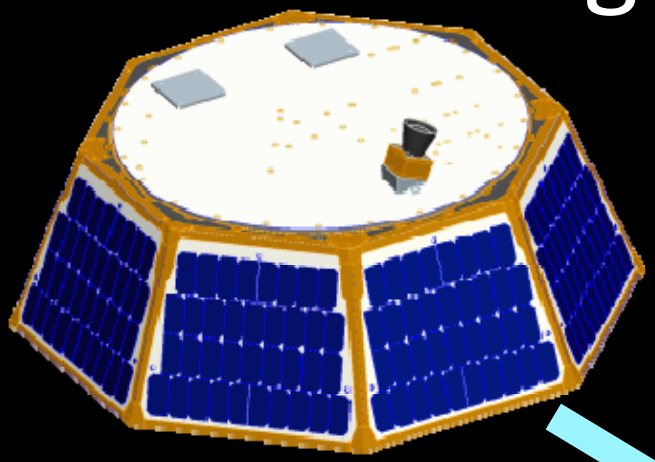

ATLAS

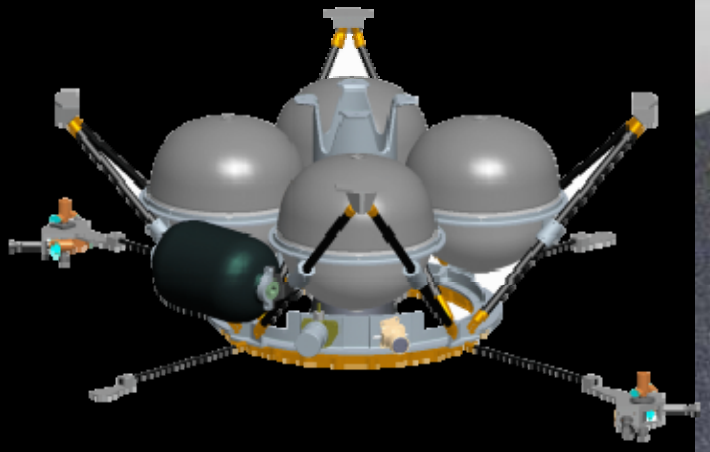

North
Sun
Earth
10 km
25 km


187-216 sec Period
Observation
Model
H2O v
CO2
SO2
CH4
CH3OH
H2S
Difference From Contimuum
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
Wavelength (mm)

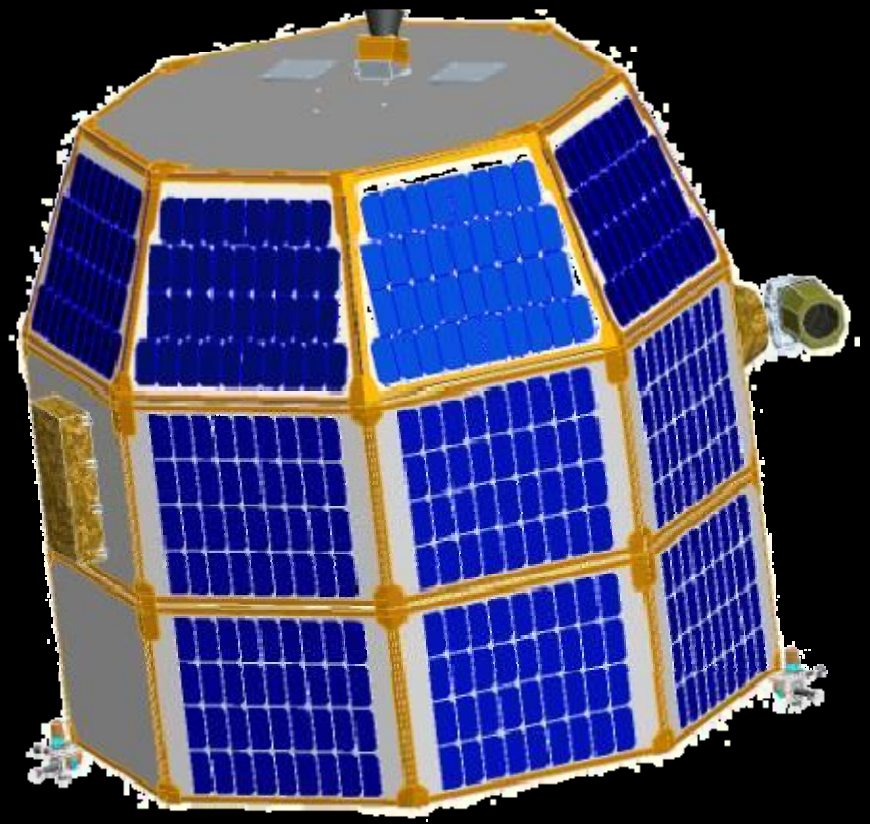

Flight Director
Flight Control

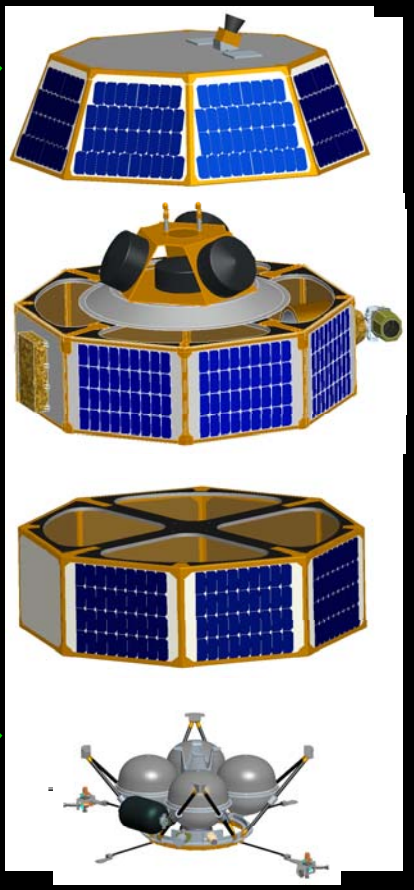
Octagonal Bus Module



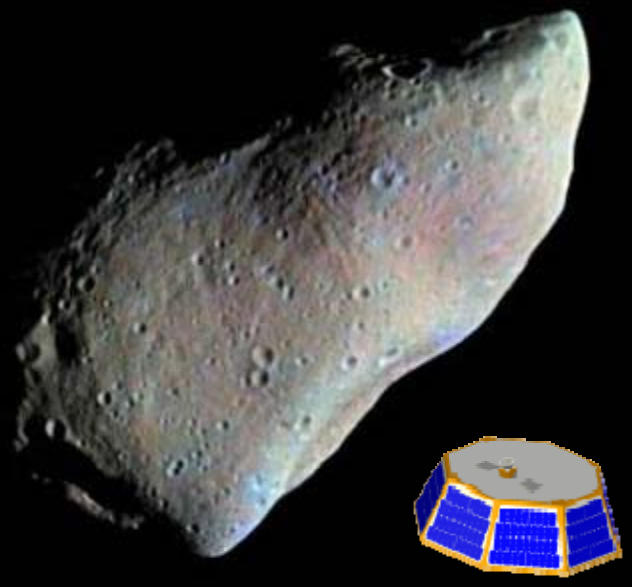


Orbiter Configuration



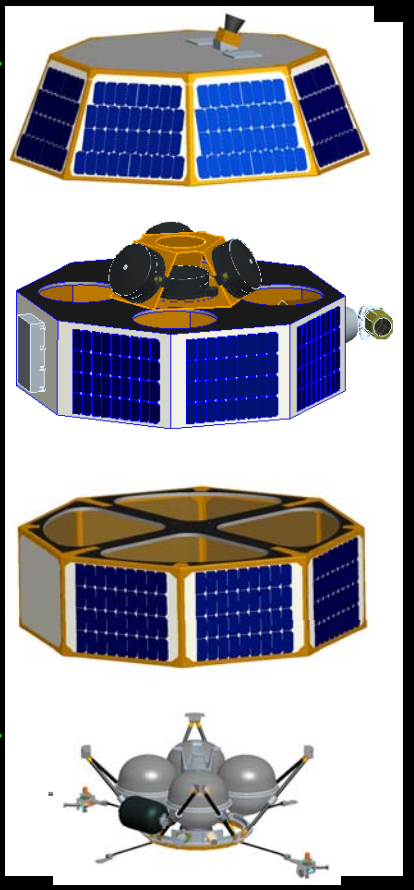


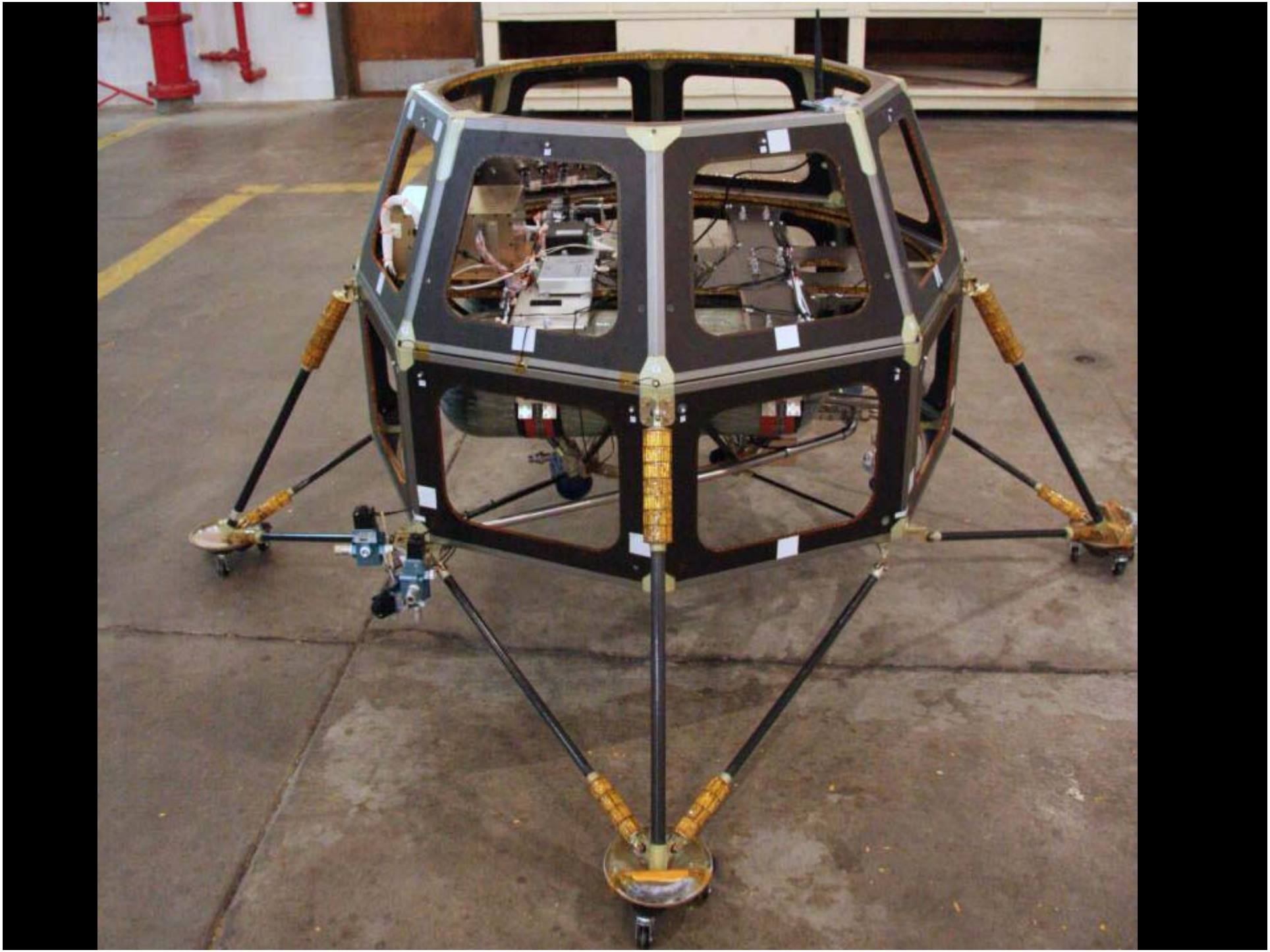
NEO Mission Concept



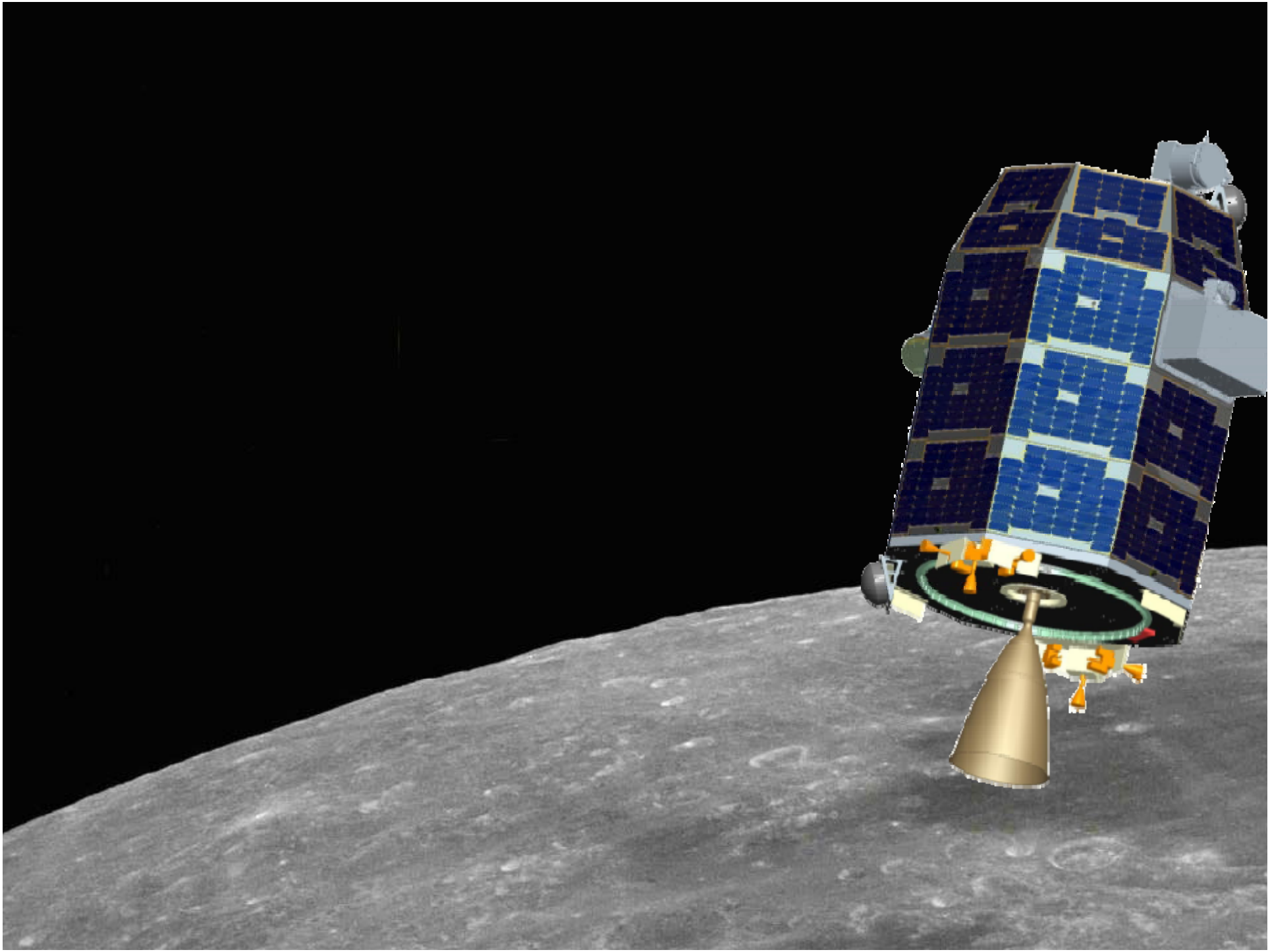
Mission Characteristics

Small Lander Configuration

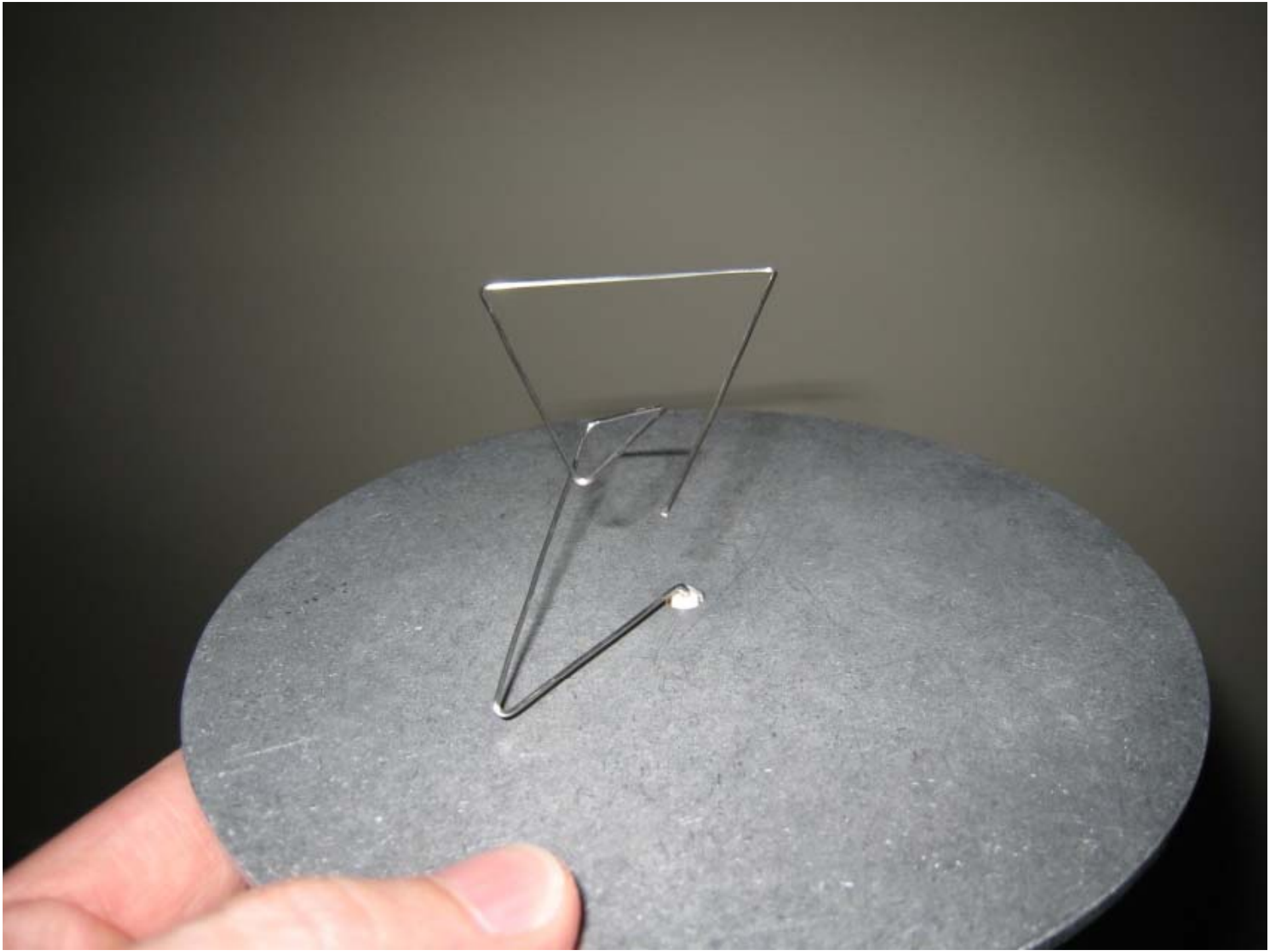


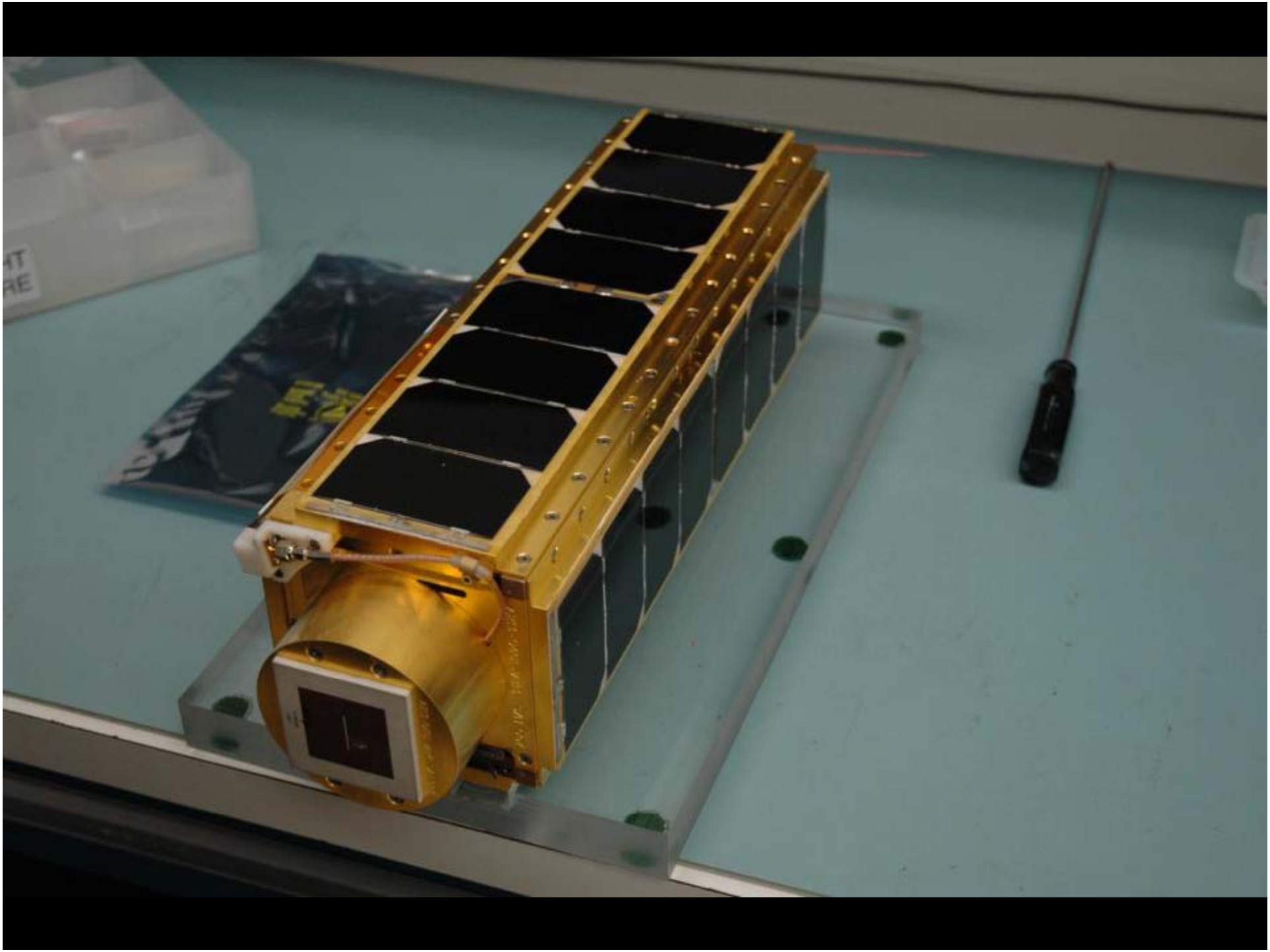


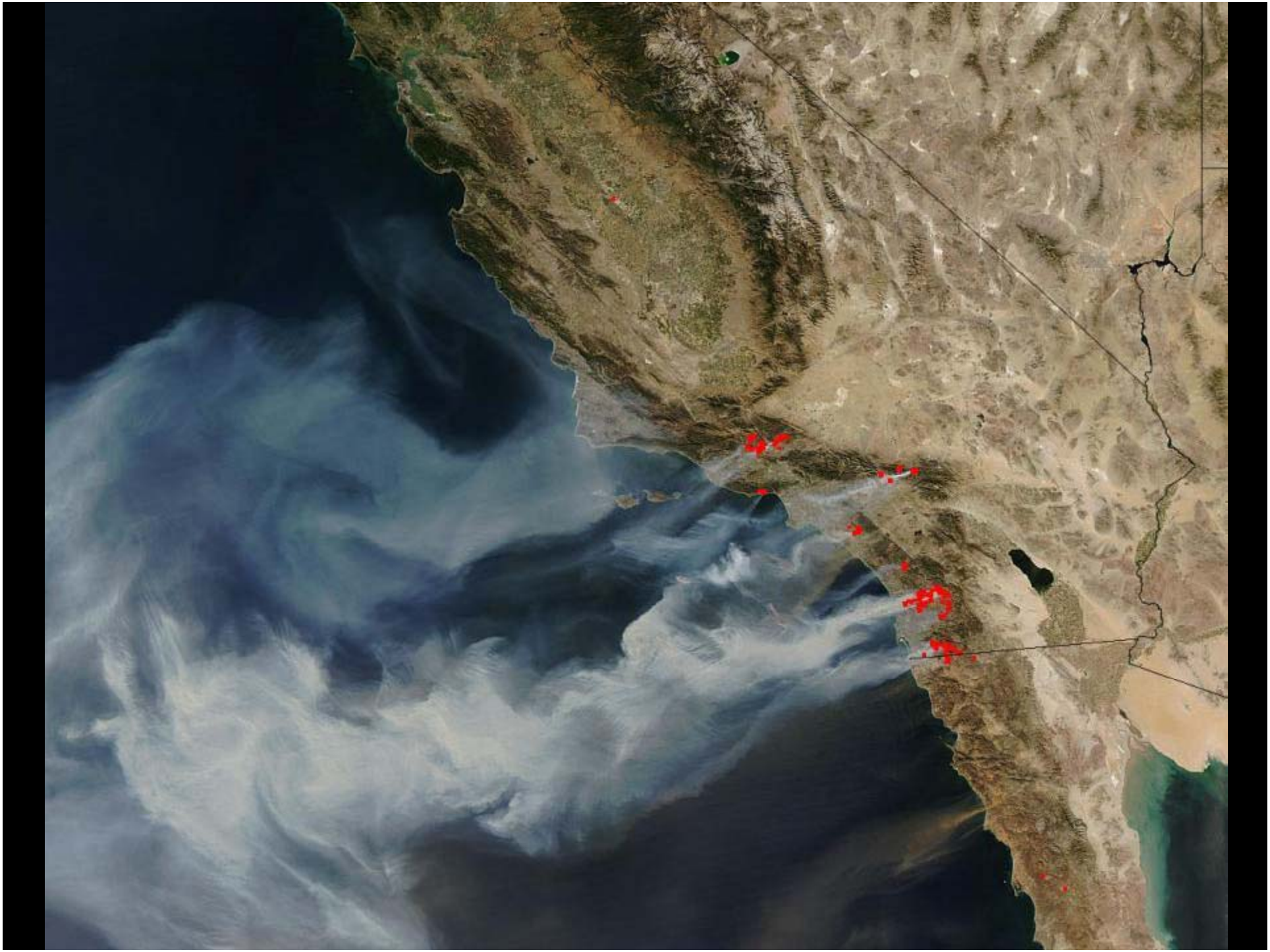

NASA



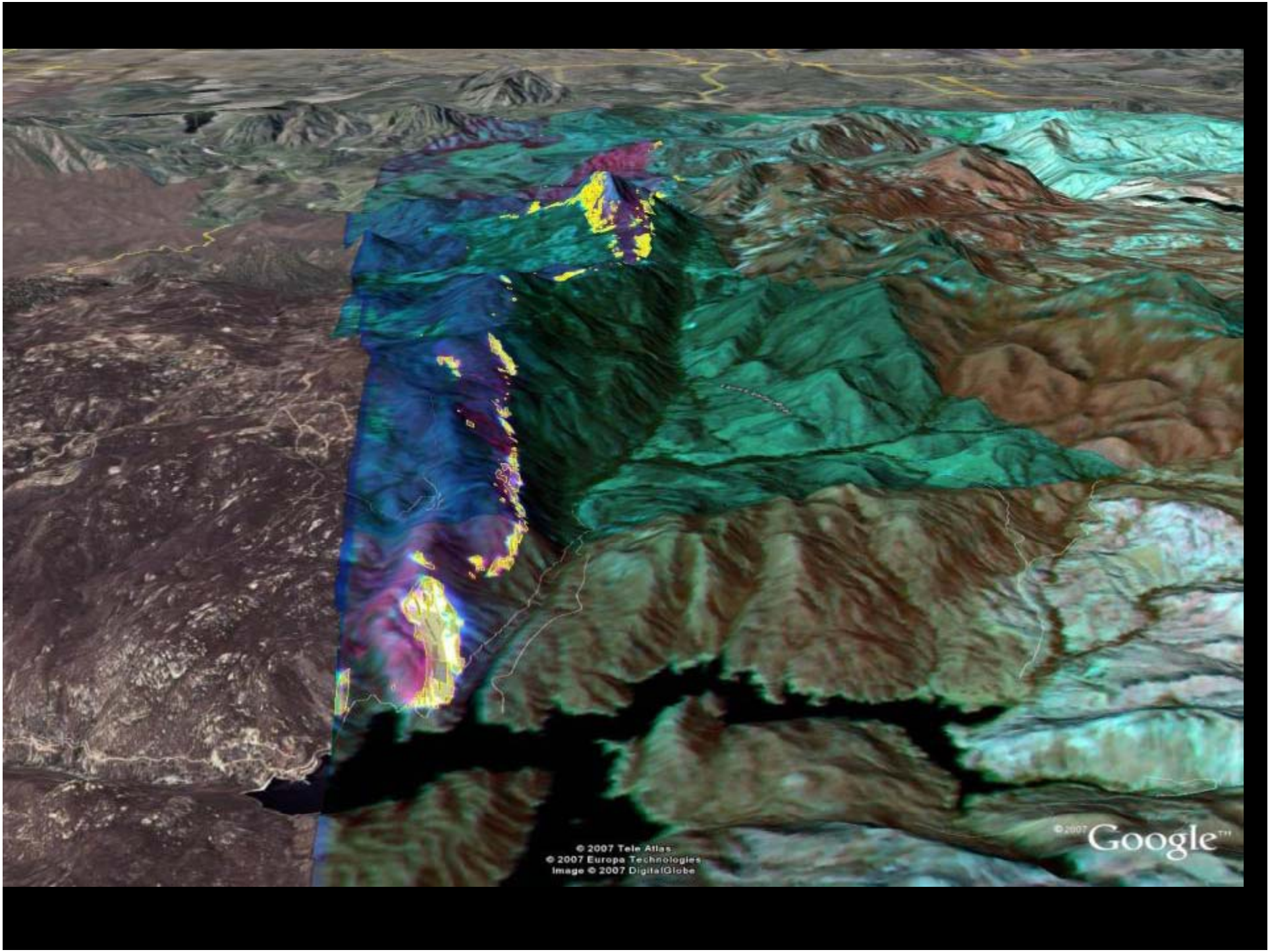
LADEE UVS Components








IKHANA
NASA
870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Robotic Recon Instruments

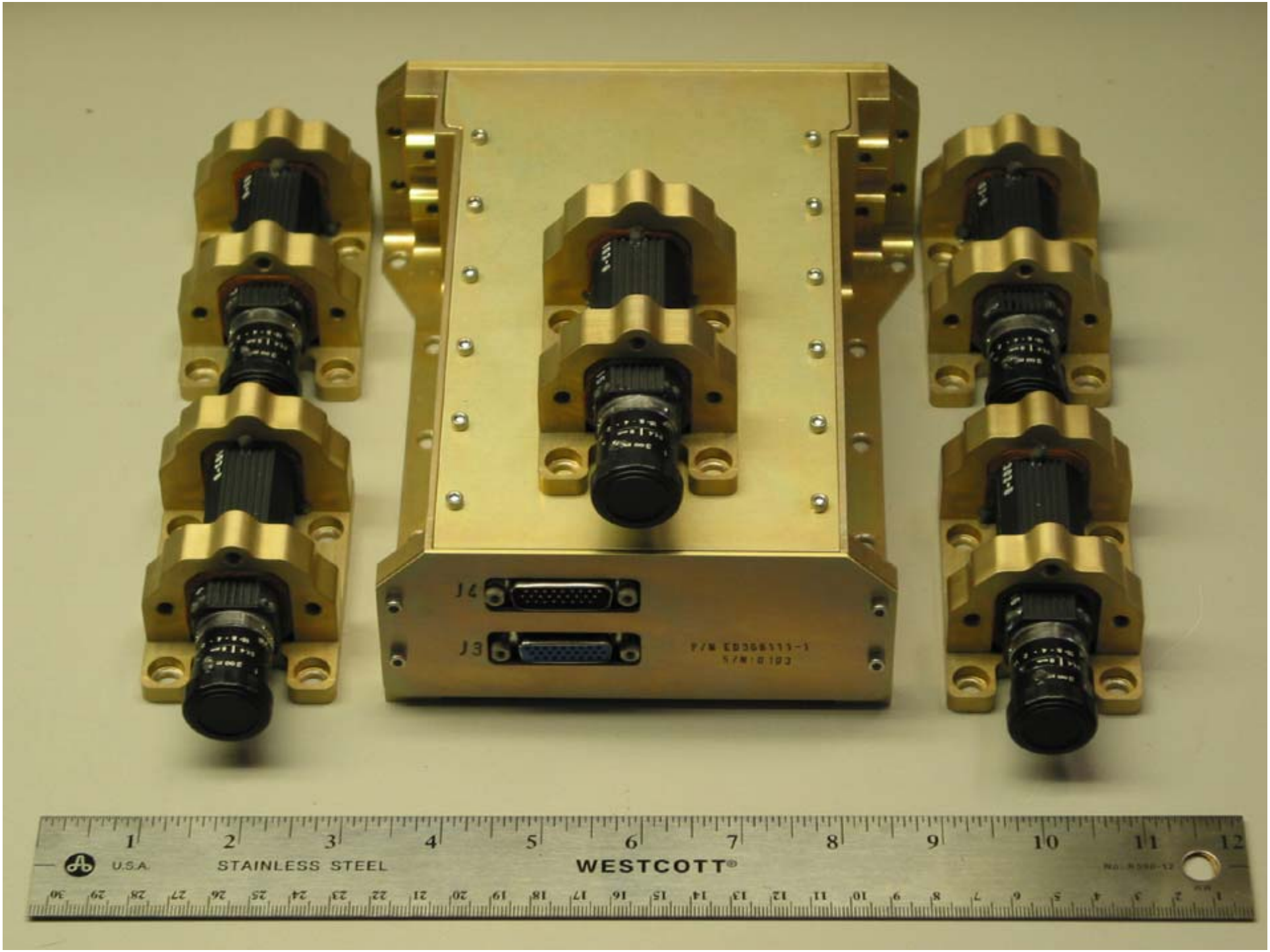
- 3D scanning lidar
  - 3D topography measuremen

PanCam (GigaPan)

- Oblique, wide-angle, color, context views
- 60x180 deg
- >100x resolution of LRO LROC-NA (and in color)

Microscopic Imager

- High-res, close-up, color, terrain views
- 72 micron / pixel
- >7,000x resolution of LRO LROC-NA (and in color)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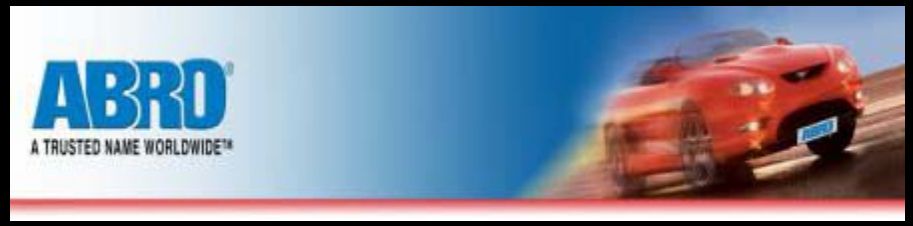
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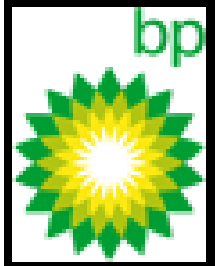
bp


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2 of 31
Composite Imag...
Visible-Light Ima...
Out of This Whirl:...
Whirpool Galaxy...
Sombrero Galaxy
Messier 82
Messier 82
Supernova Remn...
Finder Scope
Classification:
Spiral Galaxy
in Canes Venatici
Names: M51; Whirlpool Galaxy
RA : 13h29m54s
Dec : 47 : 12 : 00
Alt : 89 : 04 : 20
Az : 241 : 58 : 29
Magnitude: 8.1
Dimensions: n/a
Rise: Circumpolar
Transit: Circumpolar
Set: Circumpolar
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Research
Show object
Close
Look At
Sky
Imagery
DSS: Digitized Sky Survey (O...
Image Crossfade
Context Search Filter
All
1 of 1
Seven top galaxies
Out of This Whirl:...
Whirpool Galaxy...
M51
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NGC5194
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Canes Venatici
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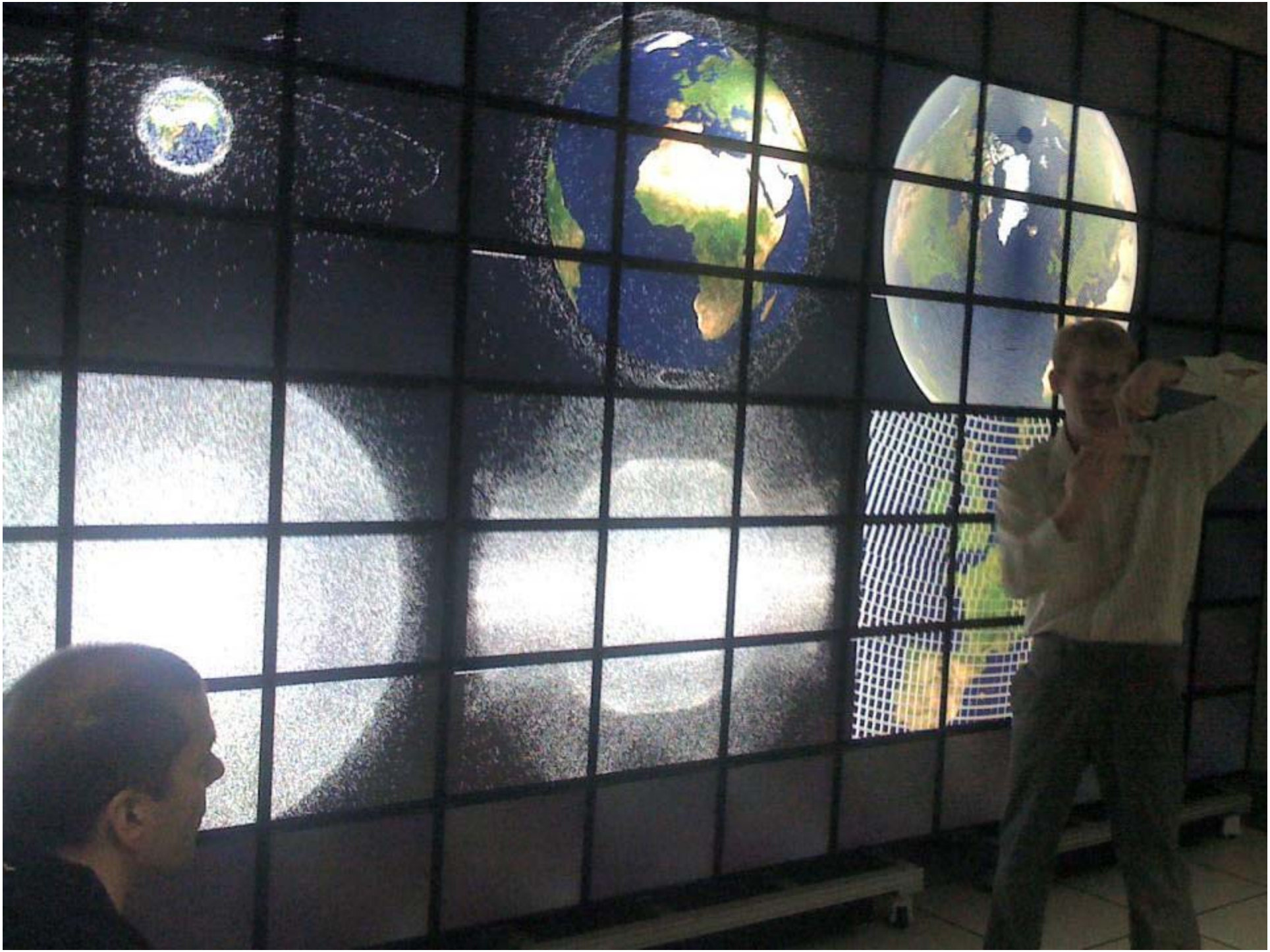
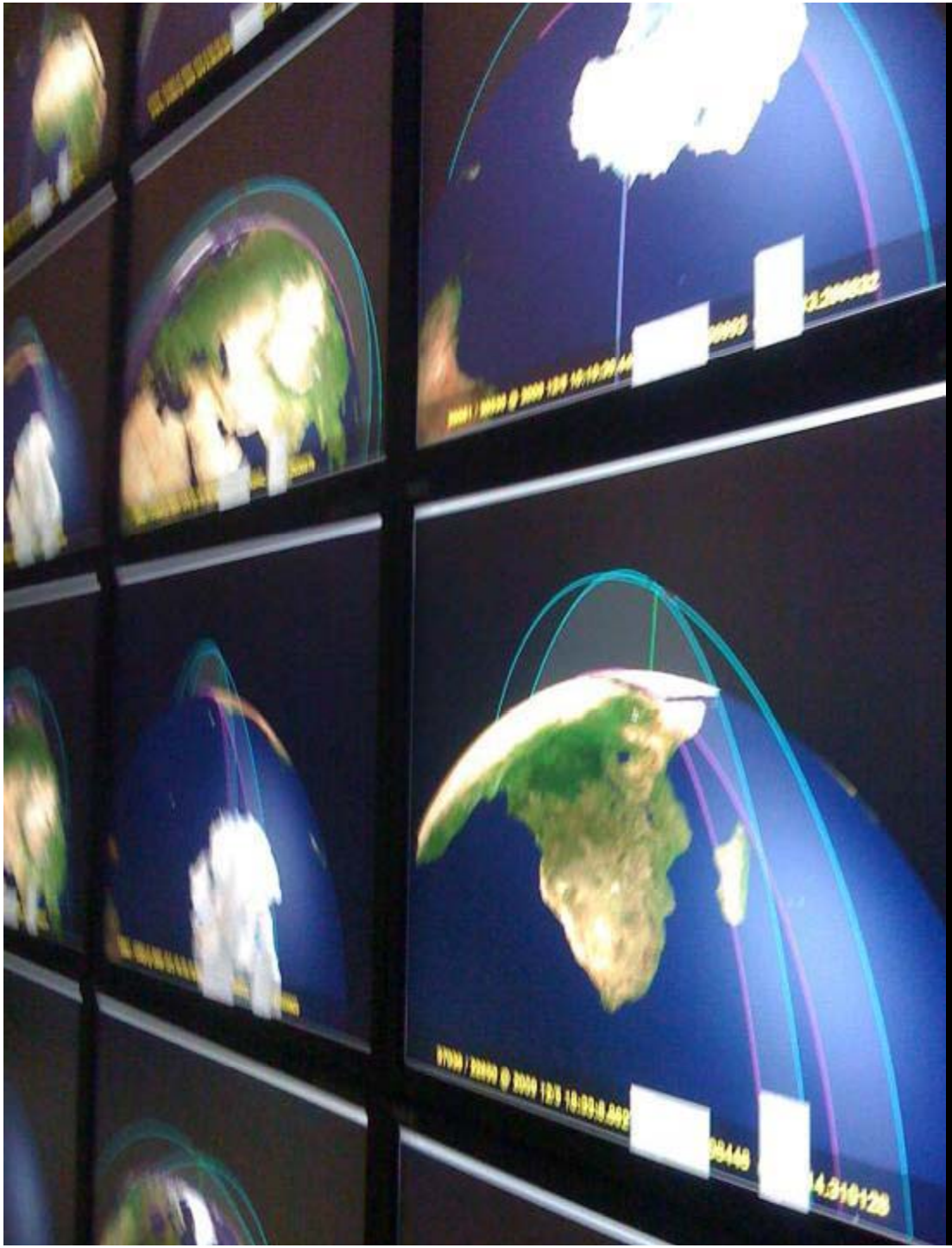
NEBULA





Highlights of NASA's FY 2011 Budget

End Constellation
Constellation behind schedule and would require large budgets to land astronauts on the Moon

Add $6 billion over five years
Top line increase of $6.0 billion over 5-years compared to the FY 2010 Budget, for a total of $100 billion over five years.

Safely fly out the Shuttle
$600 million in FY 2011 to ensure the safe retirement of the Space Shuttle upon completion of the current manifest.
$1.7 billion over ~ one year

Extend the ISS
In consultation with our partners, extends operation of the International Space Station likely to 2020 or beyond and enhances its utilization, bringing nations together in a common pursuit of discovery in space.
$15 billion over five years

Highlights of NASA's FY 2011 Budget

Demonstrate new technologies
Initiates several new programs to transform the state of the art in space technologies, including flagship exploration technology development and demonstration programs, investments in early-stage advanced concepts, potential "game-changing" technologies
$7.8 billion ("critical technologies") + $4.9 billion ("space technologies") over five years

Heavy lift and propulsion R&D
Reduce costs and shorten development timeframes for future heavy-lift systems. Target R&D activities include: New approaches to first-stage launch propulsion; In-space advanced engine technology development and demonstrations; Foundational (basic) - propulsion research.
$3.1 billion over five years

Enhance climate change research
Enhance the Nation's global climate change research and monitoring system, accelerating decadal survey missions and re-flying OCO.
$10 billion over five years

Expand aeronautics
Bring cleaner, safer, and more efficient transportation to our skies
$2.9 billion over five years

Highlights of NASA's FY 2011 Budget

Enable our commercial space sector
Directs NASA to partner with the aerospace industry in a fundamentally new way, making commercially provided services the primary mode of astronaut transportation to the International Space Station.
$6 billion over five years

Robotic missions
Provides for a robust program of robotic solar-system exploration and new astronomical observatories
$3.0 billion (exploration precursors)
+ $3.4 billion (heliophysics) + $5.6 billion (astrophysics) + $7.9 billion (planetary science) over five years

Education
Inspire more young people to engage in science, technology, engineering, and mathematics.
$750 million over five years

Operations, construction & environmental compliance
"Cross agency support". Continues to fund operations and maintenance of NASA's 9 field centers,
Funds agency-wide management functions, CS salaries?
$18 billion over five years (+ $1.9 billion over five years KSC upgrades)

Q & A