ISERV Pathfinder

ISS SERVIR Environmental Research and Visualization System

SPoRT Seminar Presentation

August 31, 2012

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SERVIR Project Lead for Data Acquisition Systems

Background

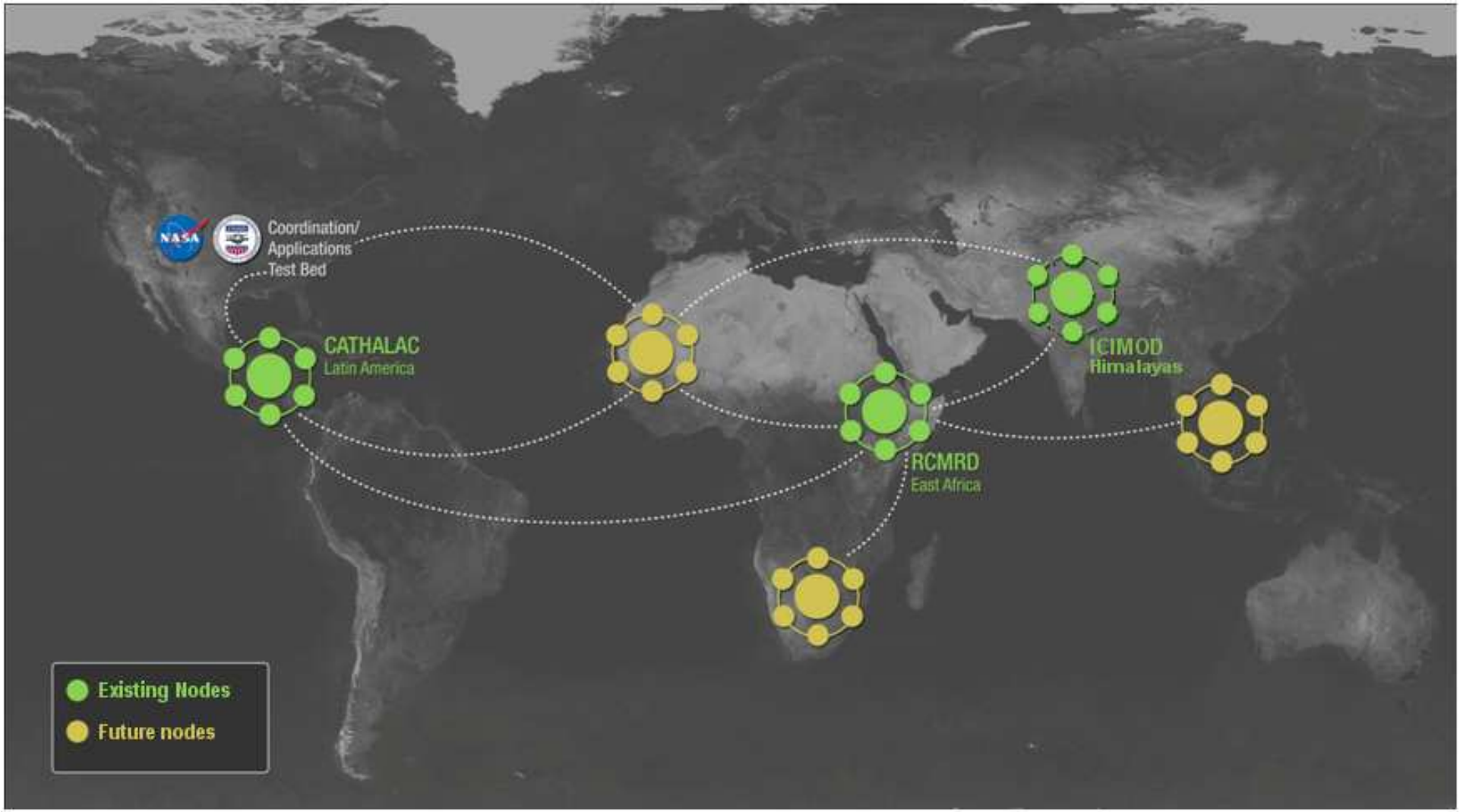
About SERVIR

- SERVIR – Spanish for "*to serve*" – is a regional visualization and monitoring system
- SERVIR integrates Earth observations (e.g., space imagery), predictive models, and *in situ* data to provide timely information products to support environmental decision makers.
- SERVIR uses satellite observations, ground-based data, and predictive models to monitor and forecast environmental changes and to improve response to natural disasters.
- SERVIR enables scientists, educators, project managers, and policy implementers to respond better to a range of issues including disaster management, agricultural development, biodiversity conservation, and climate change.

About SERVIR

- SERVIR is endorsed by governments of Central America, Africa, and Asia, and principally supported by NASA and the US Agency for International Development (USAID); a strong emphasis is placed on partnerships to fortify the availability of searchable and viewable Earth observations, measurements, visualizations, and analysis.
- The SERVIR coordination office is located at the NASA Marshall Space Flight Center in Huntsville, Alabama. Regional SERVIR hubs are located at the Regional Center for Mapping of Resources for Development (RCMRD) in Kenya, and the International Centre for Integrated Mountain Development (ICIMOD) in Nepal. There is also a "graduated" hub at the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC) in Panama.

SERVIR Global Network

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Rationale

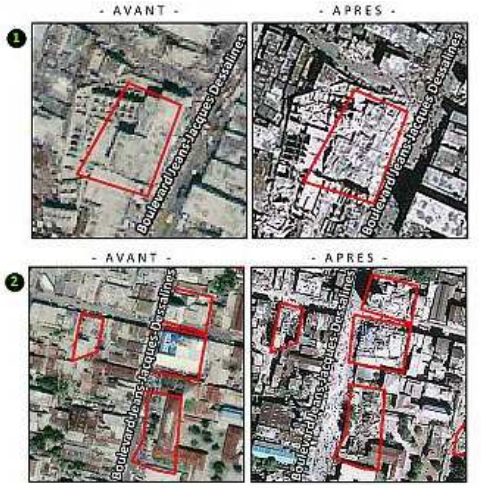
Application Development

SERVIR is a regional visualization and monitoring system that integrates Earth observations, predictive models, and *in situ* data to provide timely applications to support environmental decision makers dealing with...

- *Public Health*
- *Environmental Monitoring*
- *Air Quality*
- *Climate Change and Biodiversity*
- *Short Term Weather Prediction*
- ***Disaster Analysis***

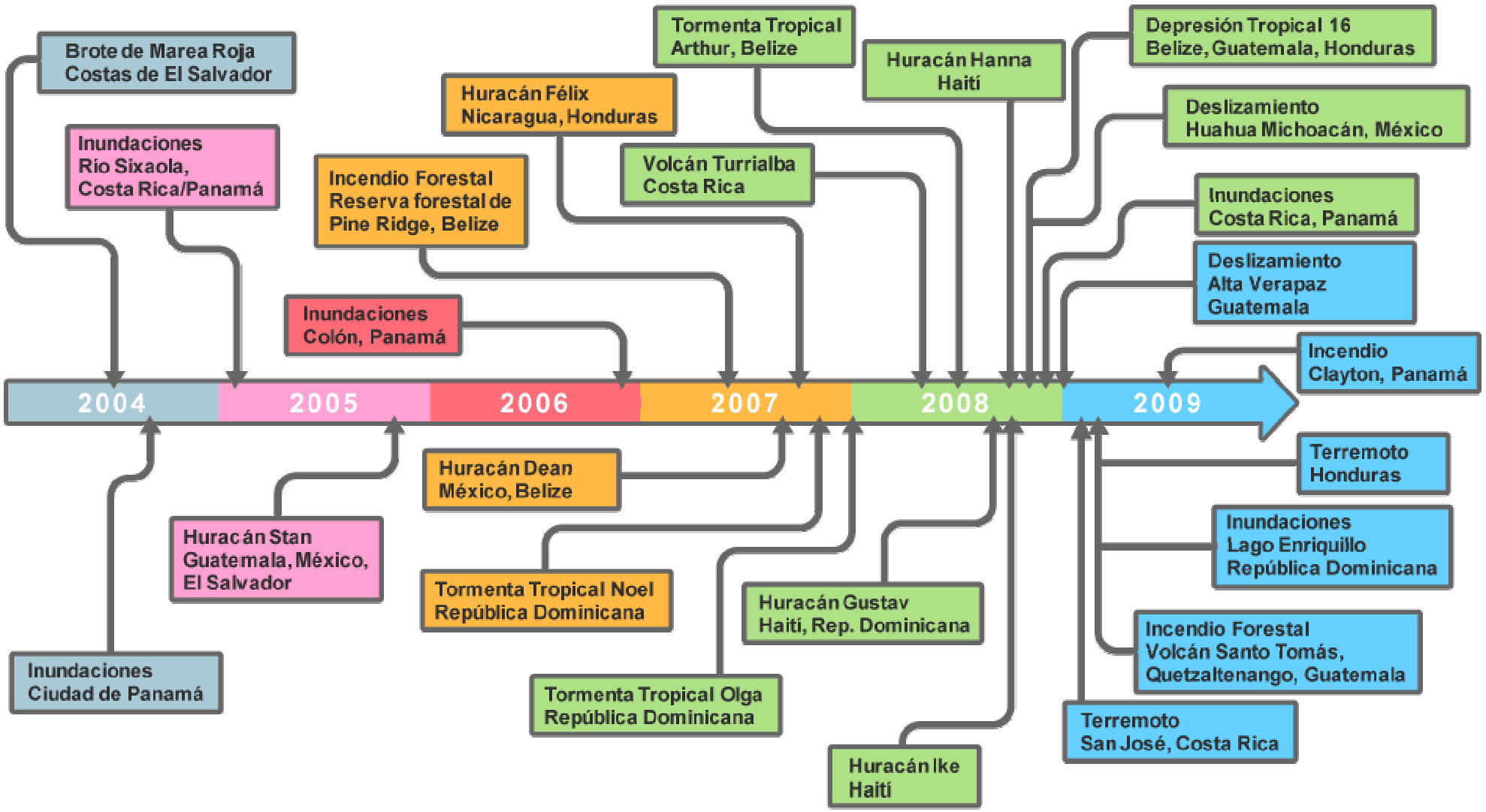
Mapping Landslide in Guatemala
January 2009

Fires in Guatemala and Mexico
April 2009



Damage/Landslide in Haiti
January 2010

SERVIR Disaster Timeline



El Salvador – November, 2009

- 192 Dead
- 6000 Homeless
- US$150,000,000 infrastructure damage

SERVIR Concept of Operations

- SERVIR uses a variety of Earth observation satellite data sources.
- SERVIR provides various products to support environmental decisions, disaster response, and other societal benefit areas.
- In emergencies, SERVIR must task commercial and public data sources (including NASA) to monitor and assess disasters.
- **SERVIR controls no physical assets for data acquisition.**

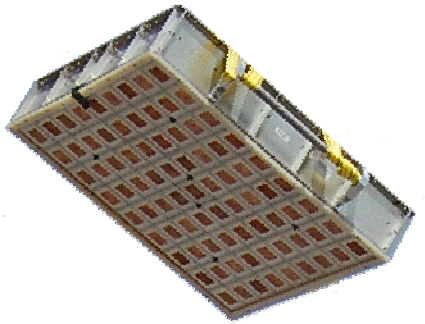
This is what keeps us up nights!!!

ISERV Development

- **ISERV-W: Internal Visible/Near-Infrared (VNIR)**
  - Attached to ISS via WORF using 3-axis gimbaled mount
  - Pointing utilizing INS stream
  - High spatial resolution
  - Moderate spectral range

- **ISERV-E: External Visible/Broad-Infrared (V/IR)**
  - Attached to ISS via fixed mount on existing external attachment locations
  - Enhanced spatial resolution
  - Extended spectral range
  - Enhanced pointing
  - Capable of tracking targets

- **ISERV-PM: External Passive Microwave**
  - L-band / C-band / Ku-band Phased Array
  - Attached to ISS via fixed mount on existing external attachment locations
  - 100m^2 array of multi-frequency sensors



ISERV-W1

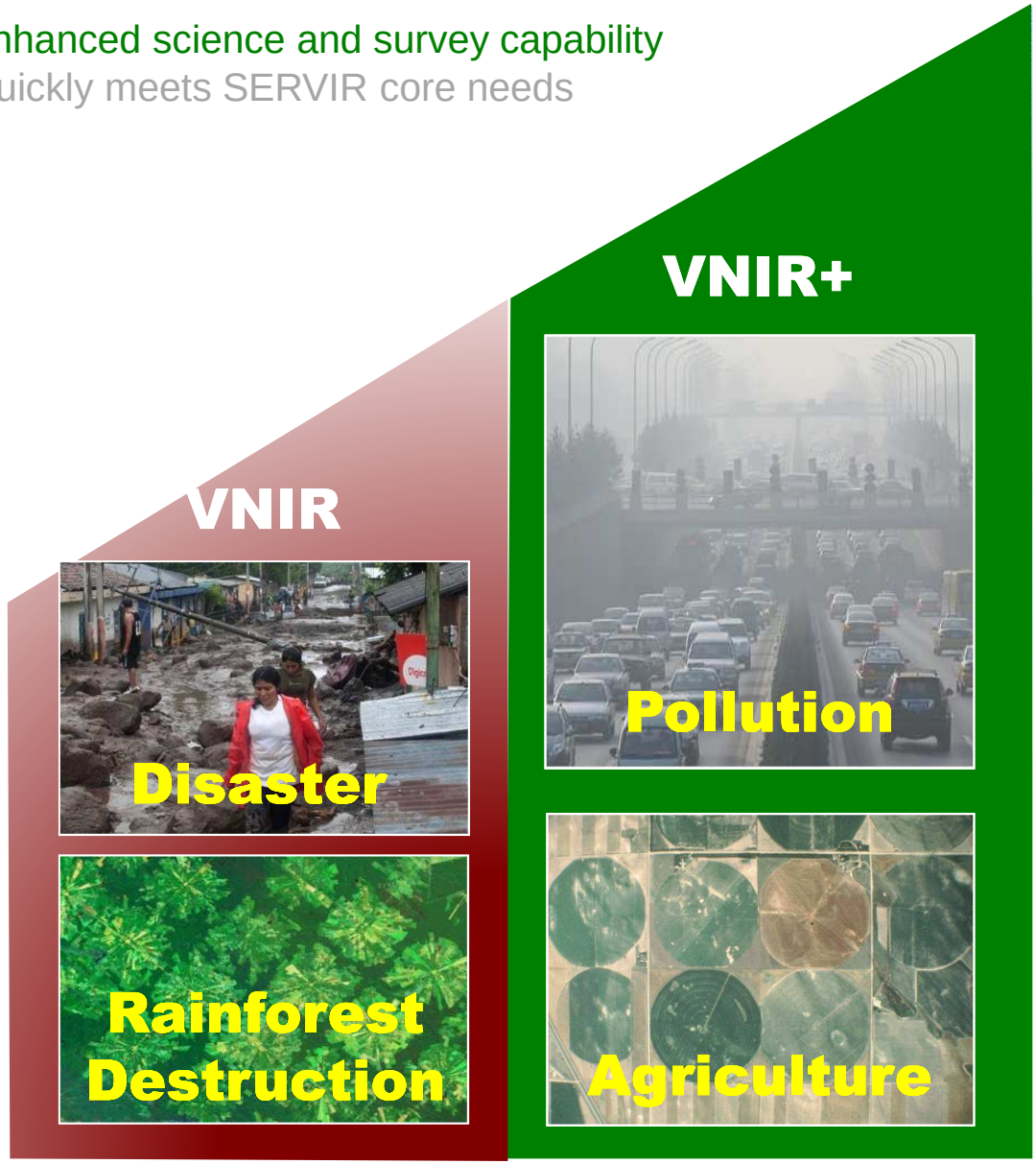
- Quickly meets SERVIR core needs

Science

Capability

ISERV-W2

- Enhanced science and survey capability
- Quickly meets SERVIR core needs

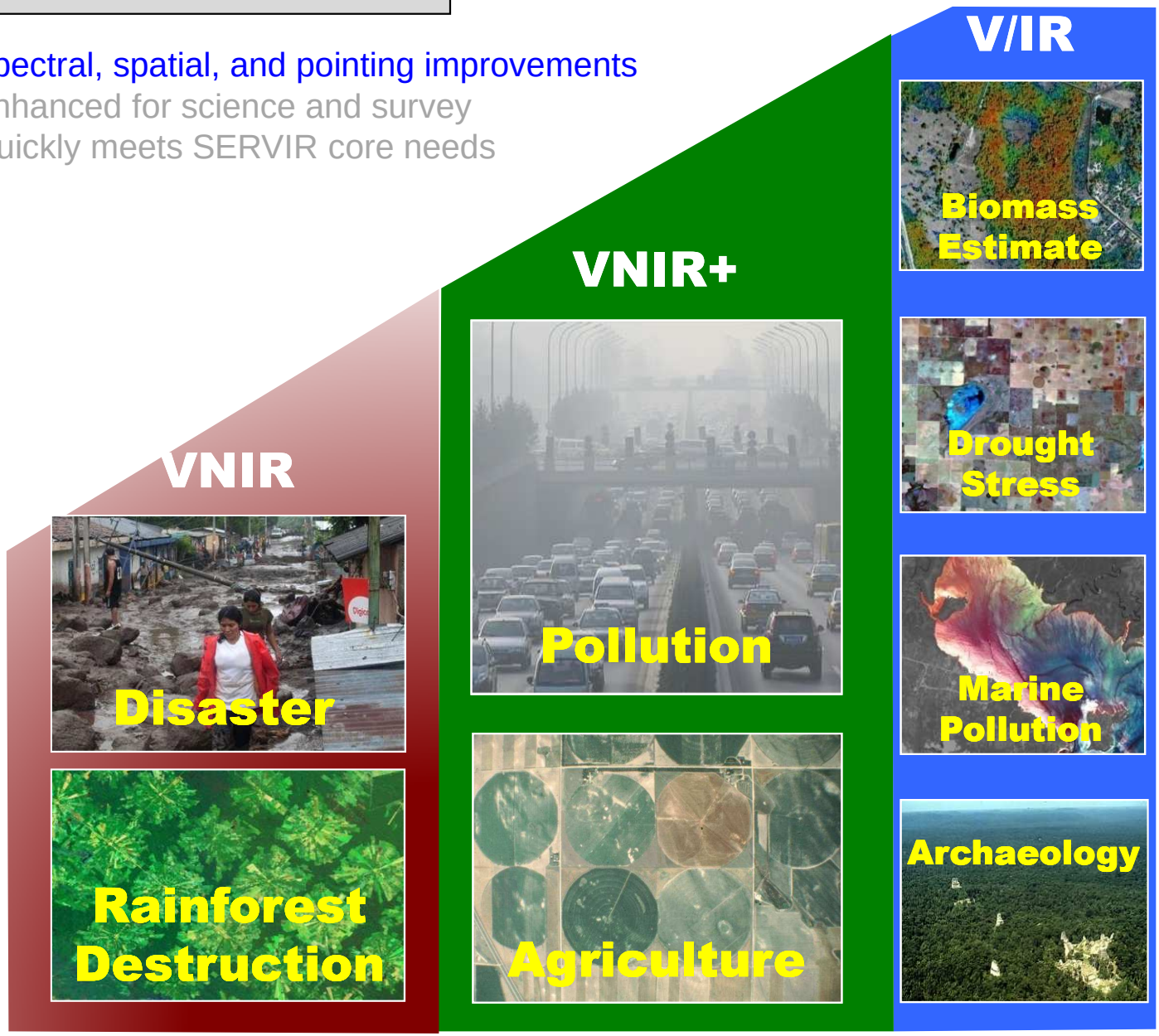


Science

Capability

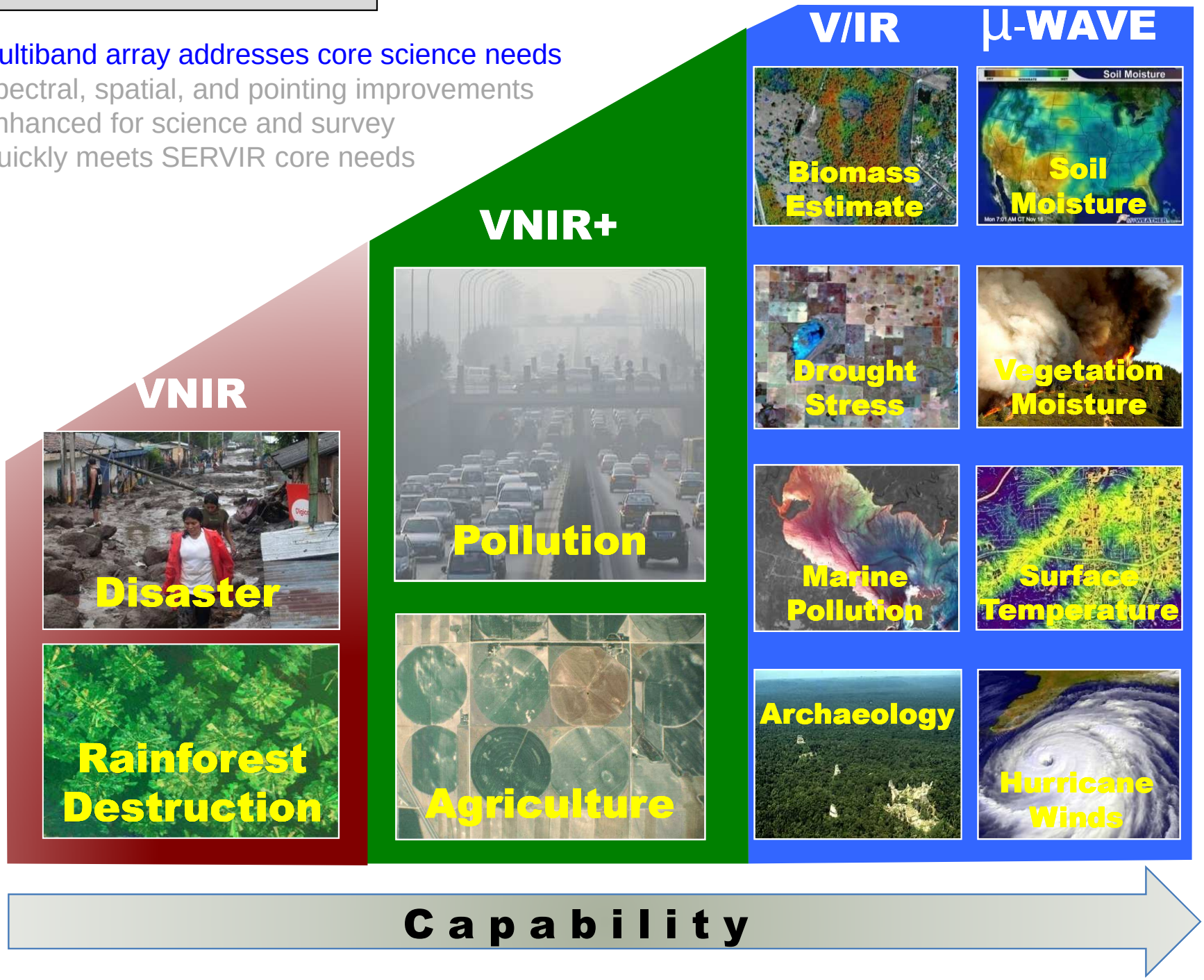
ISERV-E

- Spectral, spatial, and pointing improvements
- Enhanced for science and survey
- Quickly meets SERVIR core needs



ISERV-PM

- Multiband array addresses core science needs
- Spectral, spatial, and pointing improvements
- Enhanced for science and survey
- Quickly meets SERVIR core needs



A Pathfinder for SERVIR & ISS

As a preliminary step, we are deploying a *Pathfinder* imaging system for developmental testing in WORF to:

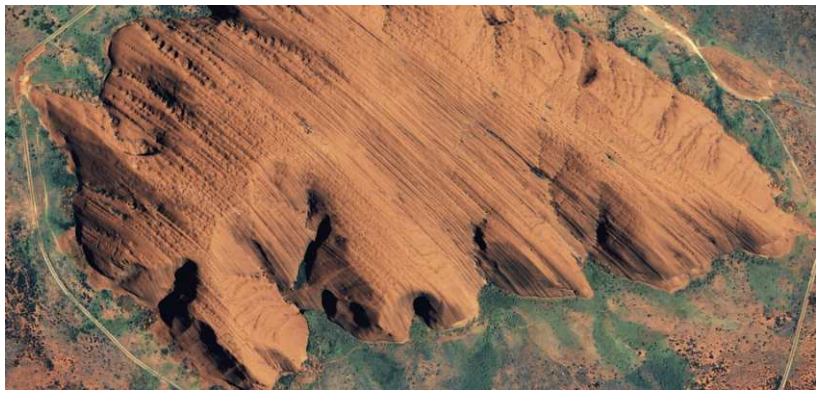
- **Develop general tasking, utilization, ground command, data acquisition, and processing experience**
- **Develop image acquisition, processing, and analysis capabilities**
- **Develop full command / acquisition / processing operations capabilities for ISERV humanitarian aid & disaster monitoring and assessment operational requirements.**
- **Inform the definition of requirements for an operational external ISERV Imaging System**

What Do We Expect?

- The primary result of ISERV Pathfinder will be operational experience to inform and improve the design of an operational, external SERVIR imaging system.

- Low-cost Pathfinder testing will buy down programmatic and technical risk with the eventual operational, external SERVIR imaging system.

- **Acquisition of images with utility for humanitarian assistance and Earth science applications.**

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Hardware

I/SERV Pathfinder Telescope Assembly

Celestron CPC925 9.25”
Schmidt-Cassegrain Telescope
On Alt-Az Mount

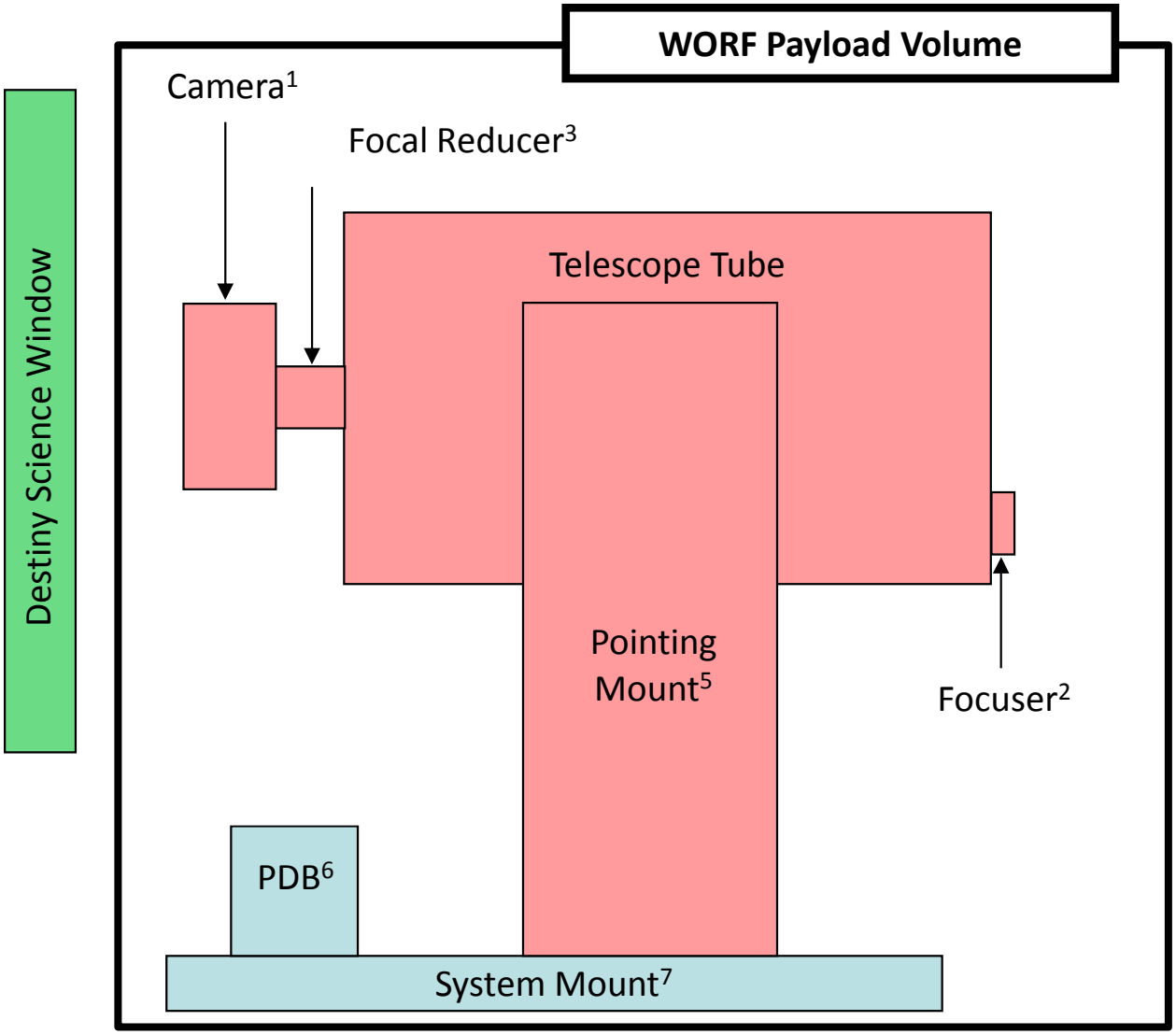
Canon EOS 7D Digital
Single Lens Reflex (DSLR)
Camera

Starizona HyperStar
Focal Reducer

Optical Performance

@ 350 km altitude	Angular	Spatial
Resolution	1.65 arcsec	2.8 m
FOV	2.36^{o} x 1.58 ^{o}	~13 km x ~9 km
Spectral	350nm to 800 nm	

ISERV Pathfinder Imaging System

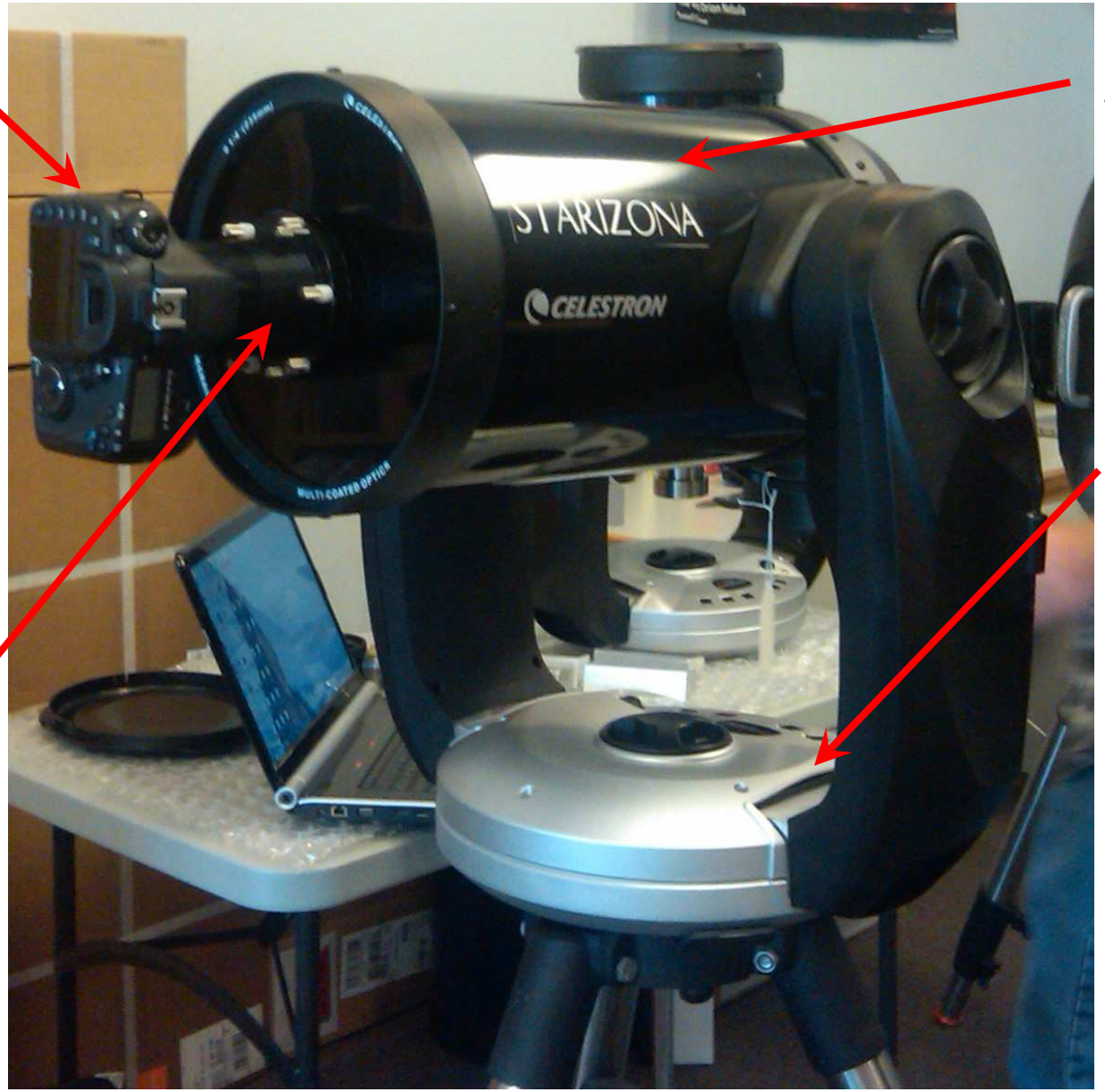


1. Canon EOS 7D
2. Starlight Instruments Microfocuser
3. Starizona Hyperstar Focal Reducer
4. Celestron 925 CPC Schmidt-Cassegrain Telescope Tube
5. Celestron 800 CPC Pointing Mount, modified for 925 Tube
6. Power Distribution Box (PDB)
7. System Mount

ISERV Optical System and Pointing Mount

Canon EOS 7D
DSLR Camera Body

HyperStar Focal
Reducer



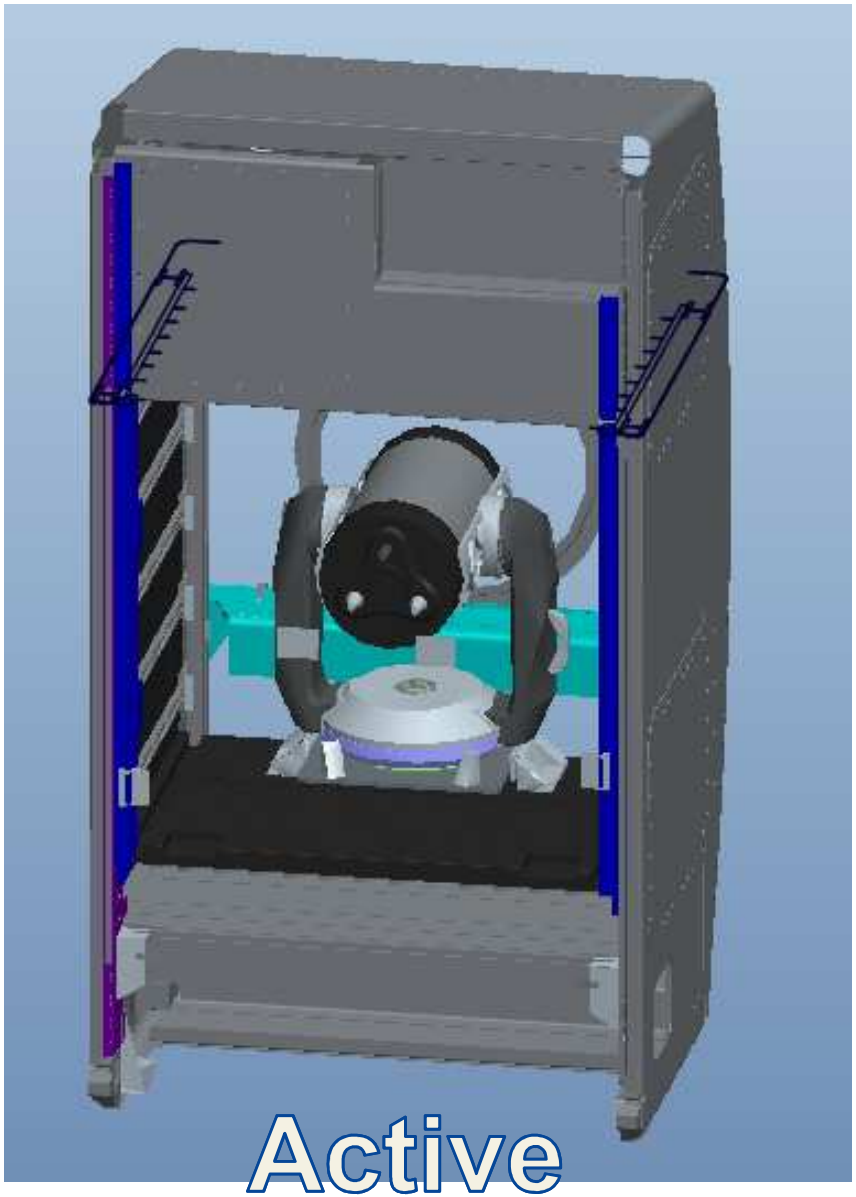
Celestron CPC 925
Telescope Tube

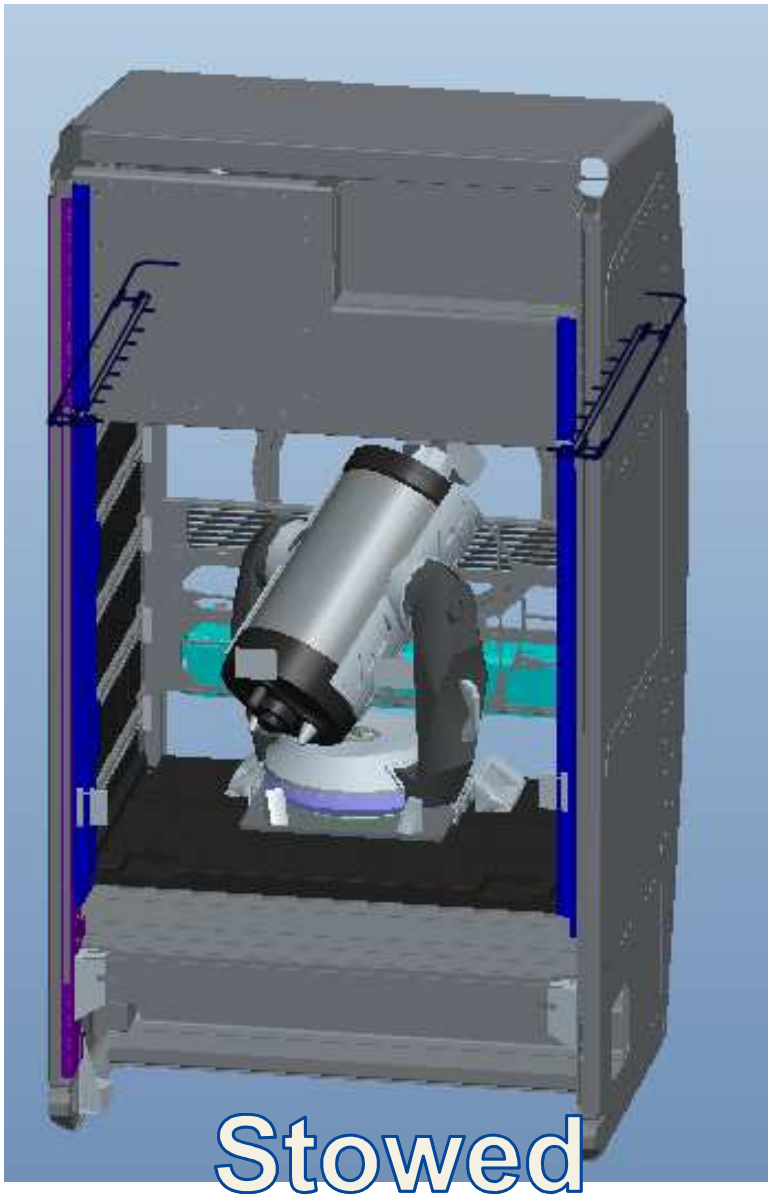
Celestron 800 CPC
Pointing Mount,
modified to
accommodate 925
Telescope Tube

Not shown:
Starlight Instruments
Feathertouch
Microfocuser

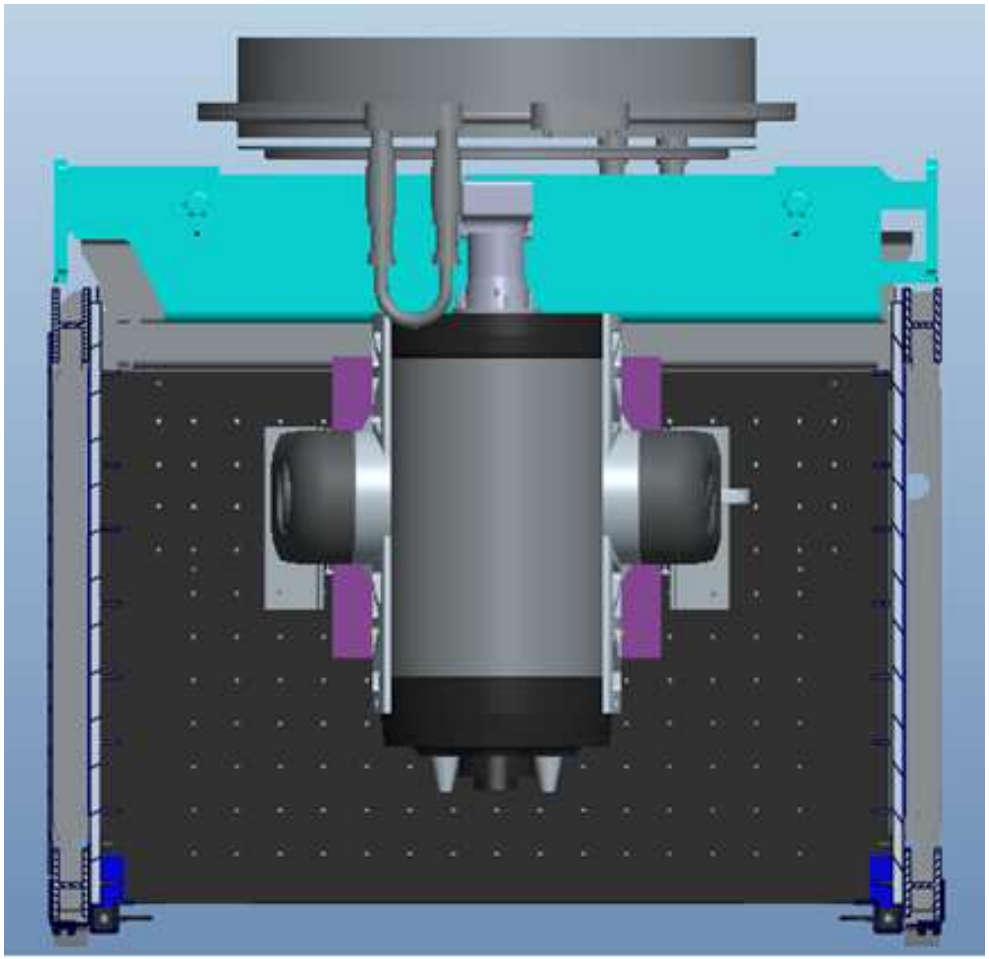
Pathfinder, As Delivered

ISERV in WORF



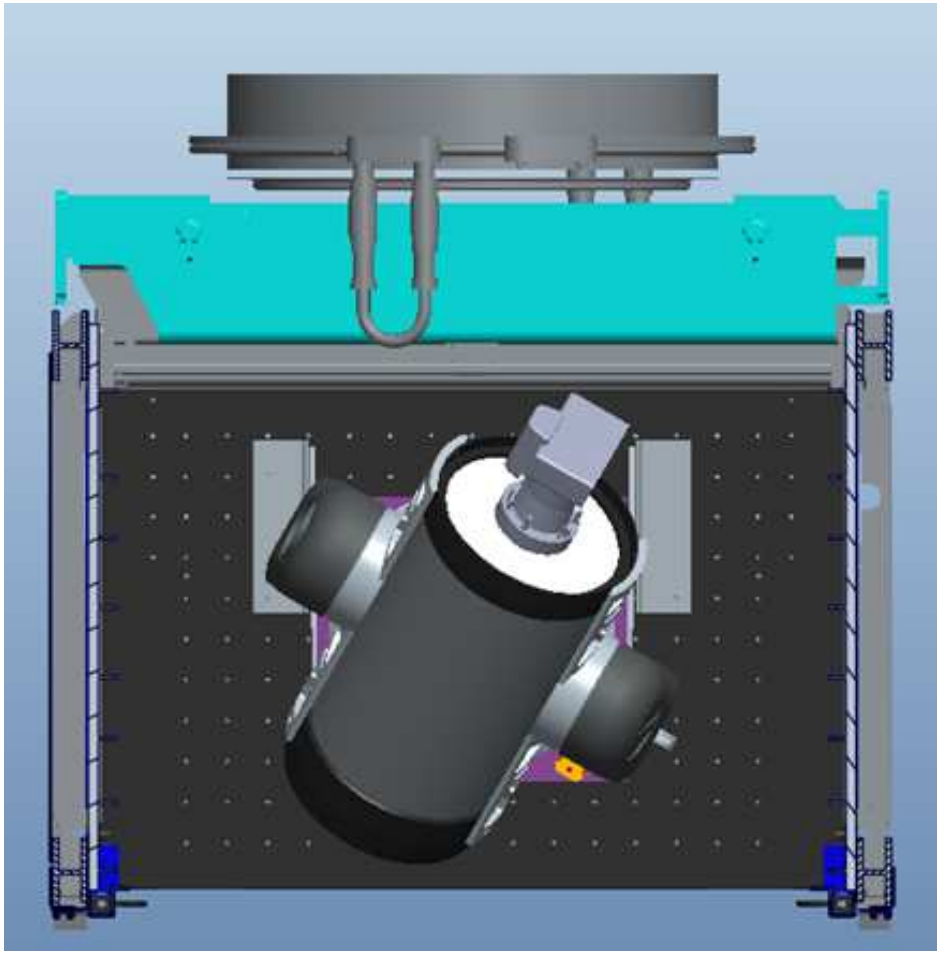


Overhead Views



Active

(bump shield lowered,
system slid toward window)



Stowed

(bump shield raised,
system retracted from window)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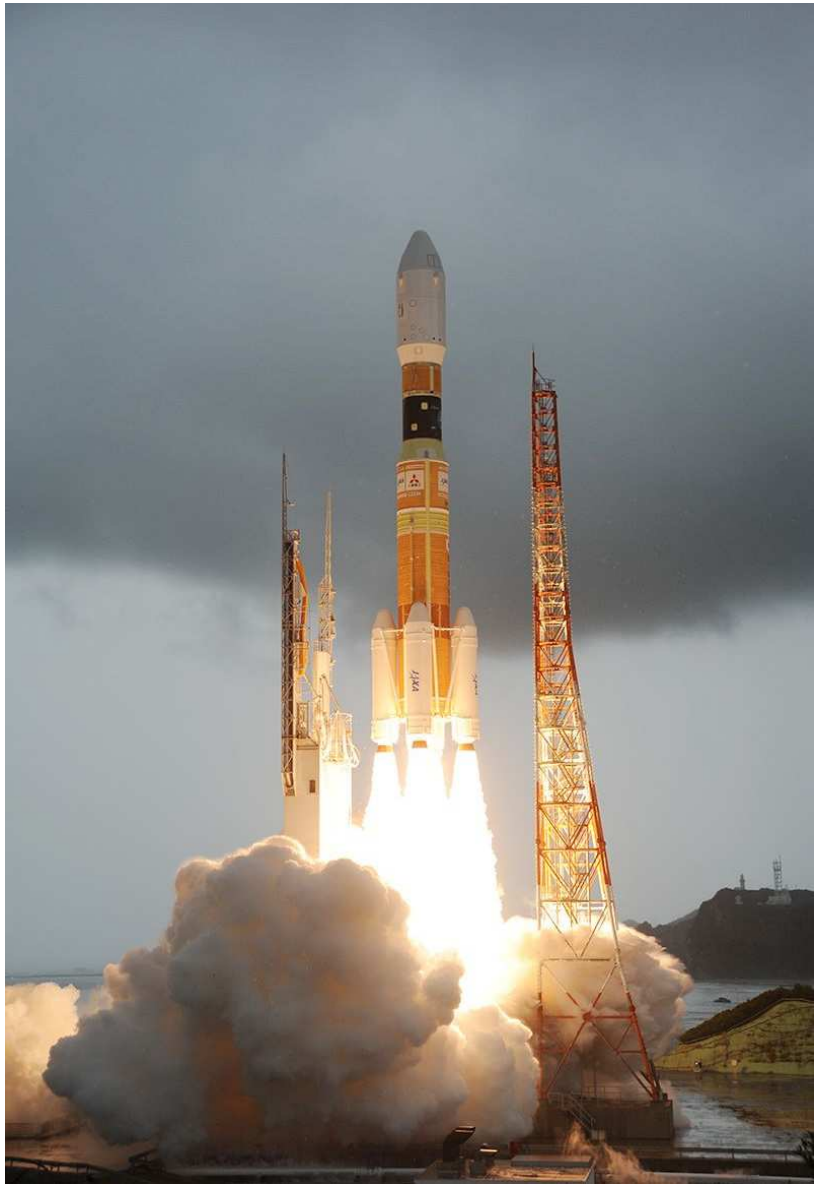
Status

Milestones

- ATP 1Mar2011
- **Launched aboard HTV-3 21Jul2012**
- SOC commissioning scheduled 3Q2012
- System characterization phase begins 1Q2013
- Normal ops immediately after



NASA Silver Achievement Award

Future Activities

- **ISERV Science Operations Center**
  - **Located at NSSTC**
  - **Commissioning 3Q12**
- **Pathfinder Science Activities**
  - **Expansion of Science Plan**
  - **Enhancement of System Characterization Plan**
  - **Expansion of systematic processing routines**
- **Pathfinder Data Service**
  - **Metadata enhancement**
  - **RDBMS creation**
  - **Web interface for search, discovery, delivery**

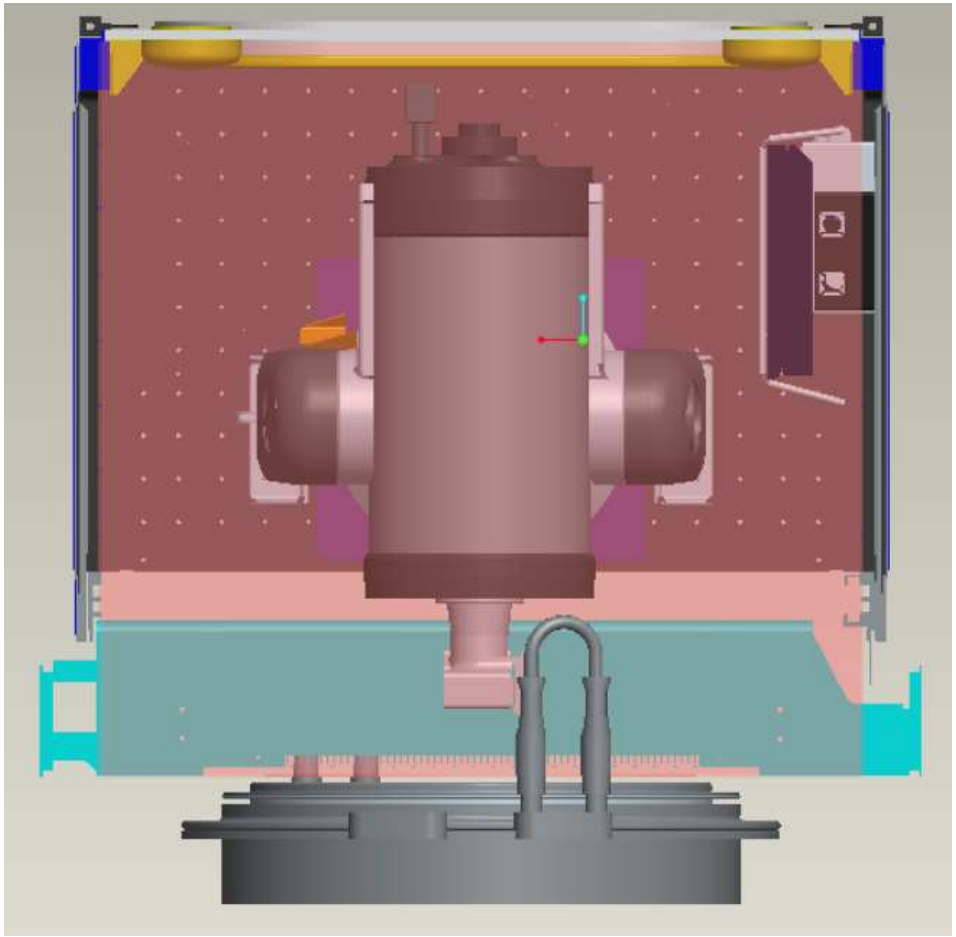
System Extension / Collaboration

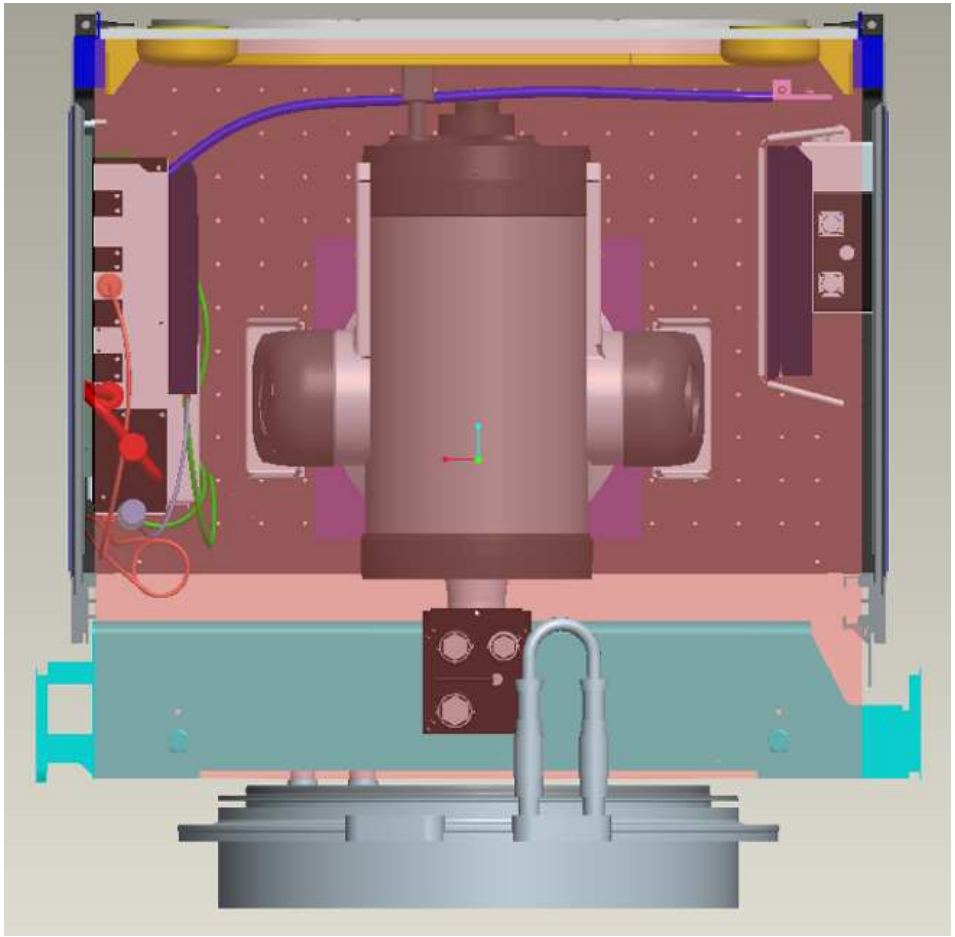
Pathfinder / ISSAC Hybrid Study

Pathfinder / ISSAC Hybrid (ISERV v1.5)

System Extension / Collaboration

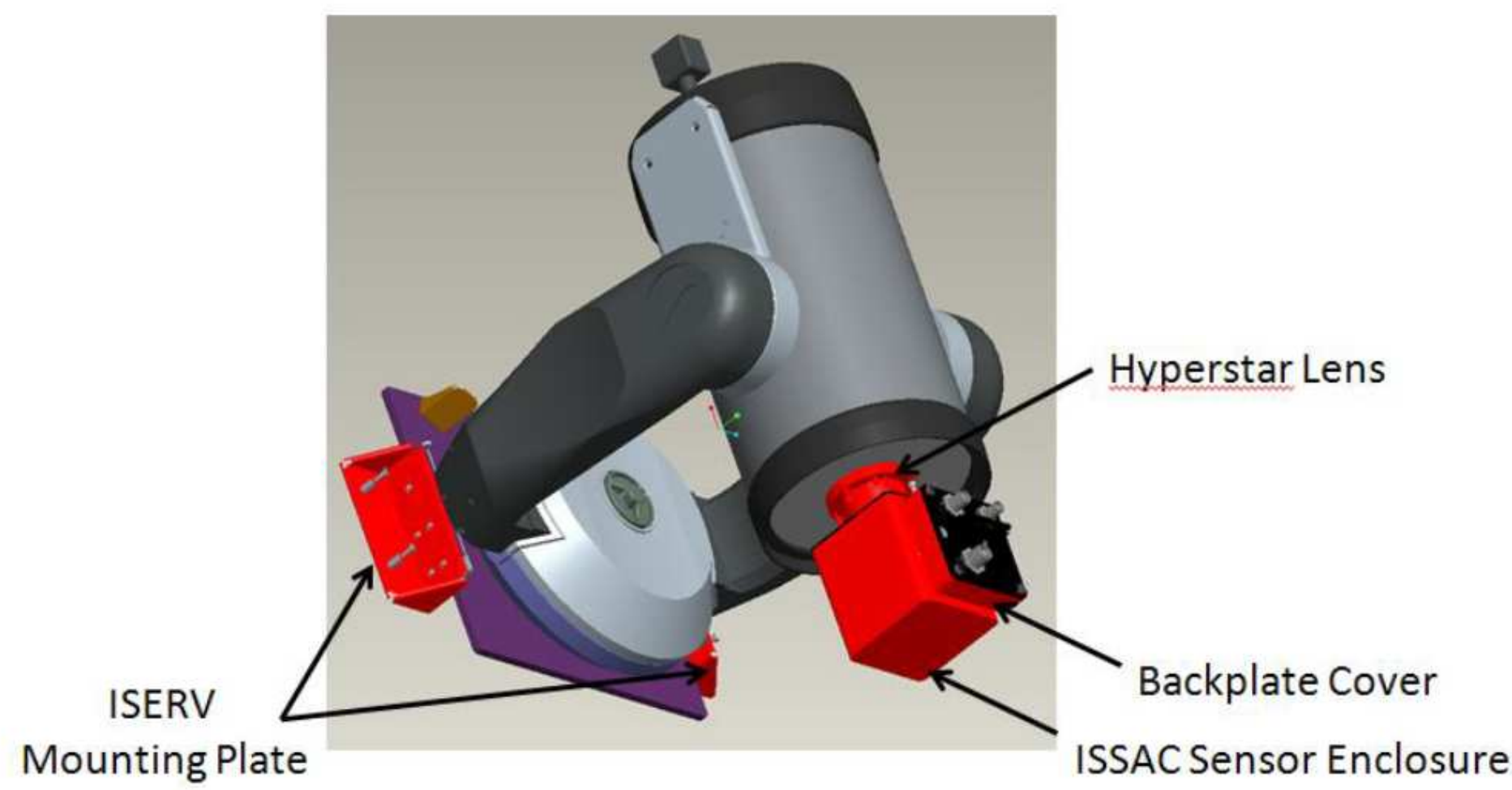
Pathfinder / ISSAC Hybrid Study





System Extension / Collaboration

Pathfinder / ISSAC Hybrid Study

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Questions?