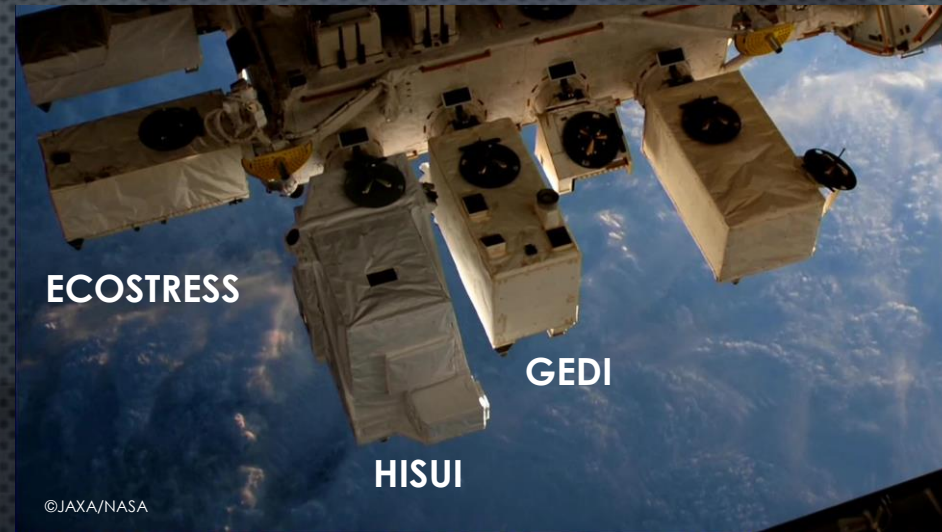


**1st DESIS User Workshop**

September 28<sup>th</sup> to October 1<sup>st</sup>, 2021

Virtual event

# HISUI STATUS UPDATE: “ONE YEAR” OPERATION IN SPACE



**TSUNEO MATSUNAGA**, NATIONAL INSTITUTE FOR ENVIRONMENTAL STUDIES, JAPAN;

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JAPAN SPACE SYSTEMS, JAPAN;

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NATIONAL INSTITUTE OF ADVANCED INDUSTRIAL SCIENCE AND TECHNOLOGY (AIST), JAPAN



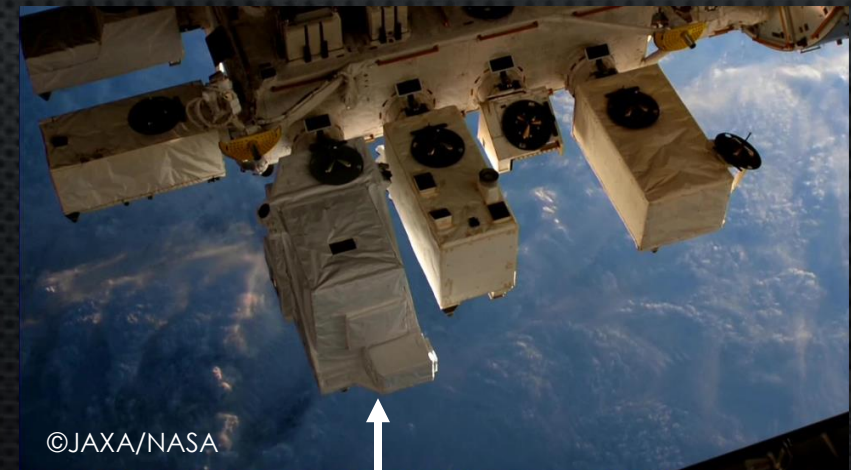
# HYPERSPECTRAL IMAGER SUITE (HISUI)

Funding	Ministry of Economy, Trade, and Industry (METI), Japan	
Operation	Japan Space Systems	
Launch	December 2019	
Platform	International Space Station	
Imaging Type / Spectral Dispersion	Pushbroom / Grating	
Spatial Resolution / Swath	20 m (CT) x 30 m (AT) / 20 km	
Spectral	Range / Bands	0.4 - 2.5 $\mu\text{m}$ / 185 bands
	Resolution	10 – 12.5 nm
	Binning	4 (VNIR) and 2 (SWIR)
SNR (30% albedo)	$\geq 450$ @620 nm $\geq 300$ @2100 nm	
MTF	$\geq 0.2$	
Dynamic Range	Saturated at 70% albedo	
Spectral Calibration	VNIR : 0.2 nm SWIR :0.625 nm	
Radiometric Calibration	Absolute : $\pm 5\%$ , among bands : $\pm 2\%$	
Onboard Calibration Sources	Halogen lamp and filter wheel	
Quantization / Data Compression	12 bits / Lossless (70%)	
Telescope Diameter	$\approx 30$ cm	
HISUI Exposed Payload Dimensions / Mass	$\approx 2.3 \times 1.5 \times 1.6$ m, $\approx 570$ kg	
Mass Storage	30 HDDs were launched with HISUI.	



# EVENTS

- ✓ Successfully launched on Dec. 6, 2019, by Space-X CRS-19 mission and installed on ISS Japan Experiment Module (JEM) / Exposed Facility on Dec. 13.
- ✓ More than six months were spent to solve data communication problems including repair part delivery.
- ✓ Observation resumed on Sept. 4, 2020.
- ✓ First onboard calibration data with the internal light source were acquired on Sept. 11, 2020.
- ✓ The first HDD delivery from ISS to the Earth by CRS-22 was occurred on July 9<sup>th</sup>, 2021. Data in HDD were about 14 TB. The second HDD delivery by CRS-23 is scheduled on September 30<sup>th</sup>, 2021. The data size will be 11 TB.
- ✓ Funding for HISUI operation up to March 2022 is secured. Negotiation with the funding agency for HISUI's extended mission from April 2022 is ongoing.



HISUI



# RETURN OF SPACE-X CRS-22



JULY 09, 2021

## DRAGON RETURNS TO EARTH FOR CRS-22 MISSION

SpaceX's Dragon spacecraft completed its 22nd Commercial Resupply Services (CRS-22) mission to and from the International Space Station for NASA, successfully returning to Earth and splashing down off the coast of Florida on Friday, July 9 at 11:30 p.m. EDT.

Dragon undocked from the International Space Station on Thursday, July 8 at 10:45 a.m. EDT and then performed three burns of its Draco thrusters to move away from the orbiting laboratory. After approximately 37 hours of phasing, the spacecraft re-entered Earth's atmosphere and deployed its two drogue and four main parachutes for a soft water landing in the Gulf of Mexico.

**CRS-23 returned to the Earth with 14 TB of HISUI data on July 9, 2021.**

<https://www.spacex.com/updates/crs-22-splashdown/index.html>



# LAUNCH AND RETURN OF SPACE-X CRS-23



<https://blogs.nasa.gov/spacexcrs23/wp-content/uploads/sites/318/2021/08/CRS-23-liftoff-Kim-1024x1536.jpg>



**CRS-23 just returned to the Earth with 11 TB of HISUI data on September 30, 2021.**

T. Matsunaga (NIES)



# IMAGES (SEPTEMBER 4, 2020)



Rodeo, Argentina



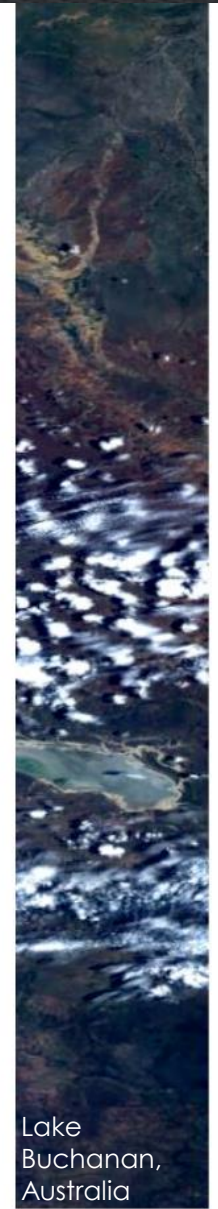
San Juan, Argentina



Kobe, Japan



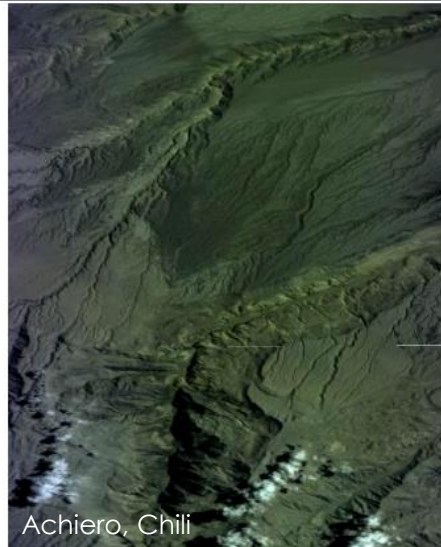
Los Amigos, Chile



Lake Buchanan, Australia



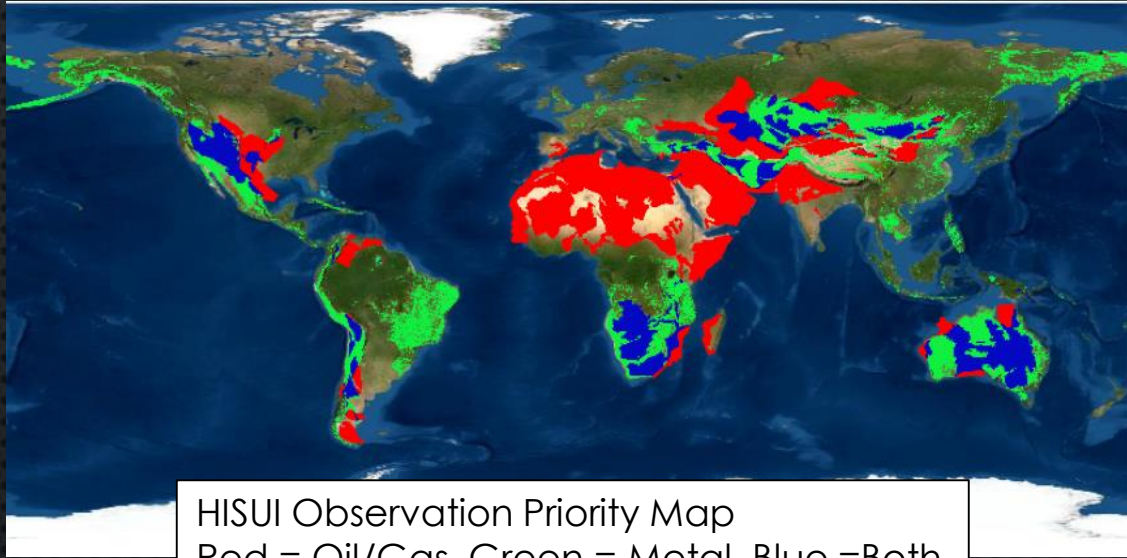
Borneo, Indonesia



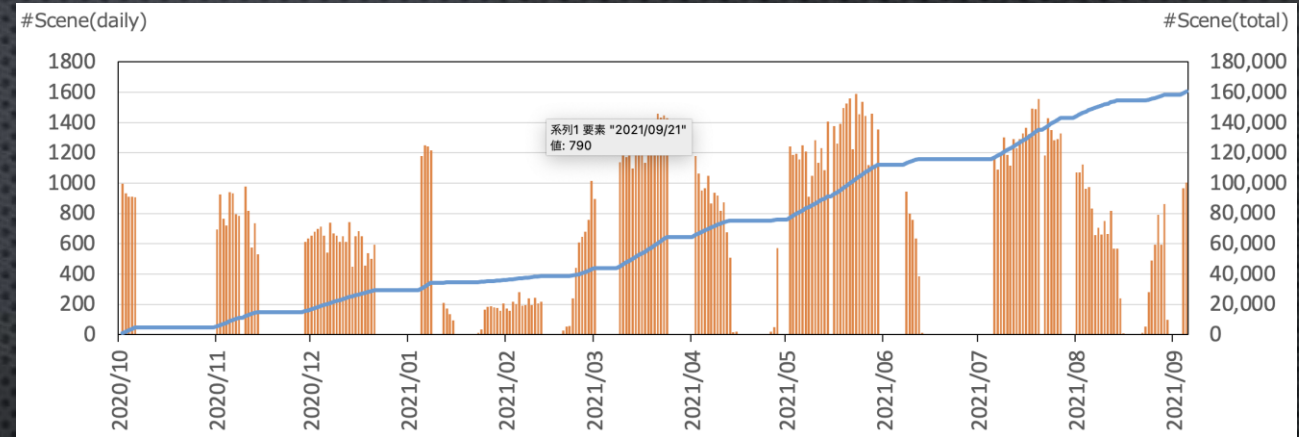
Achiero, Chile



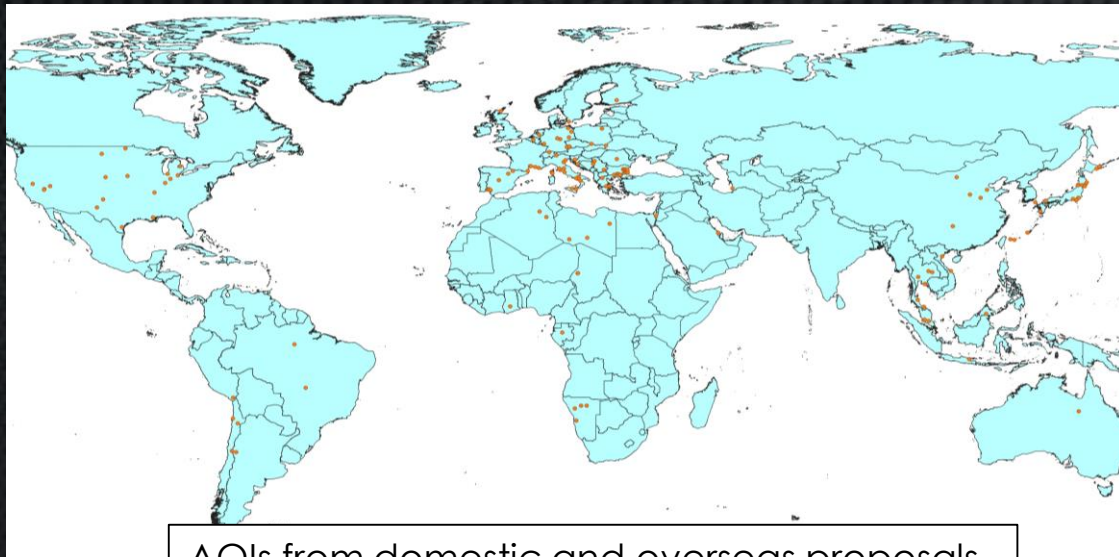
# MAPS AND CHARTS



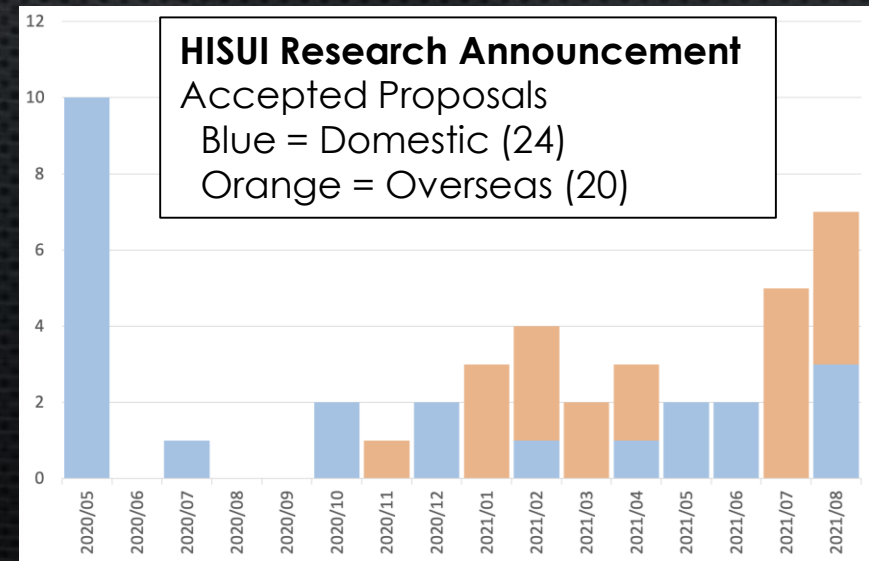
HISUI Observation Priority Map  
Red = Oil/Gas, Green = Metal, Blue =Both



HISUI has acquired 160,000 scenes ( $\approx 37.2$  Tbyte,  $\approx 96M$  km<sup>2</sup>)  
In one year (October 2020 to September 2021).

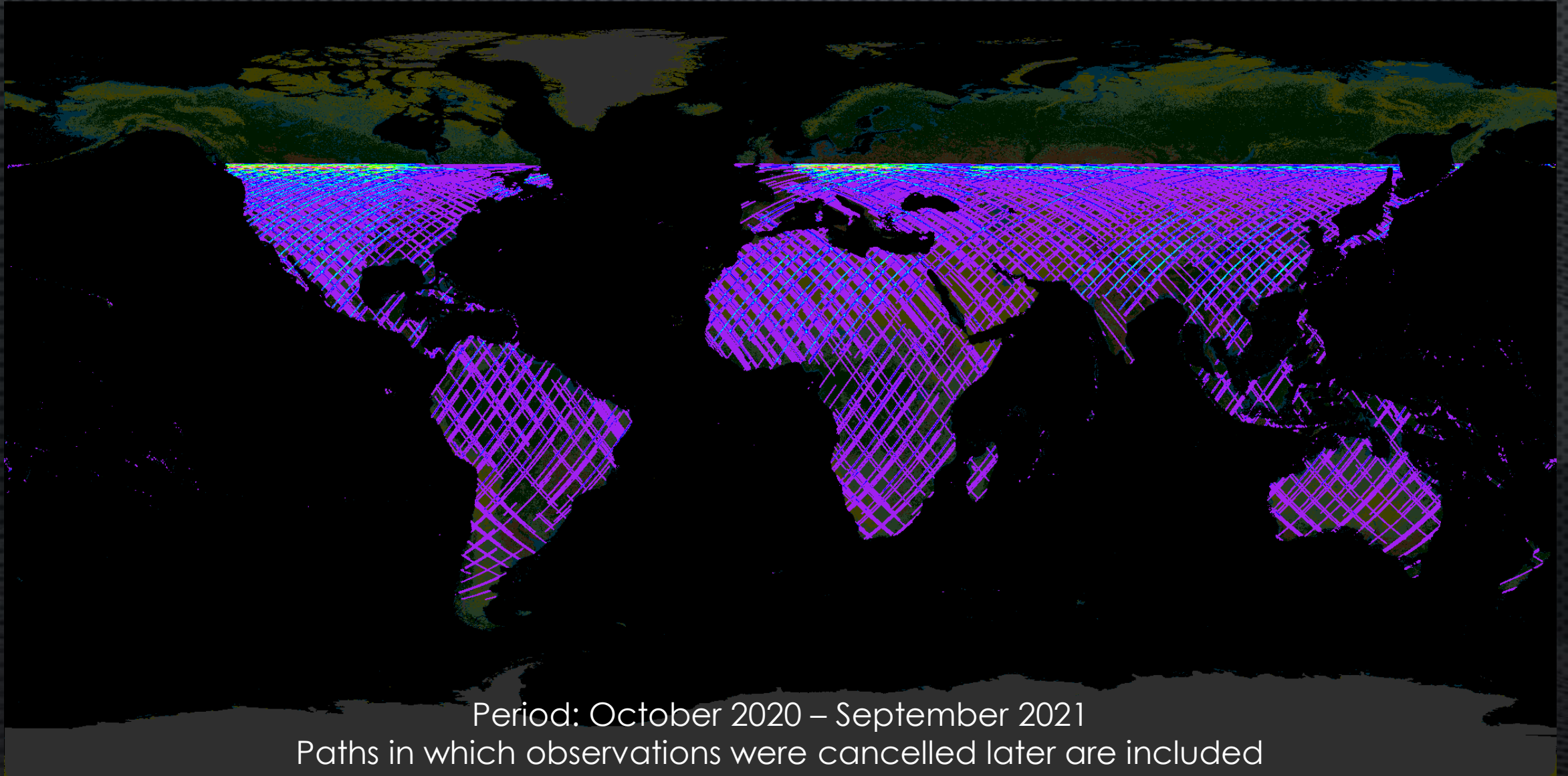


AOIs from domestic and overseas proposals





# HISUI SCHEDULED OBSERVATION MAP



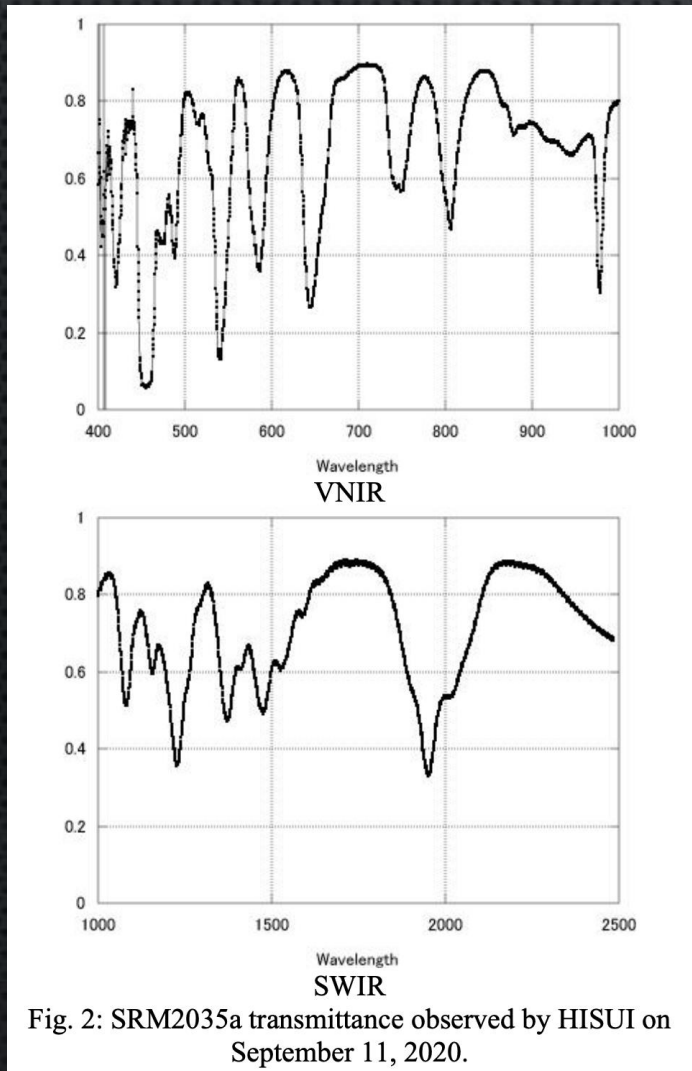
Period: October 2020 – September 2021

Paths in which observations were cancelled later are included

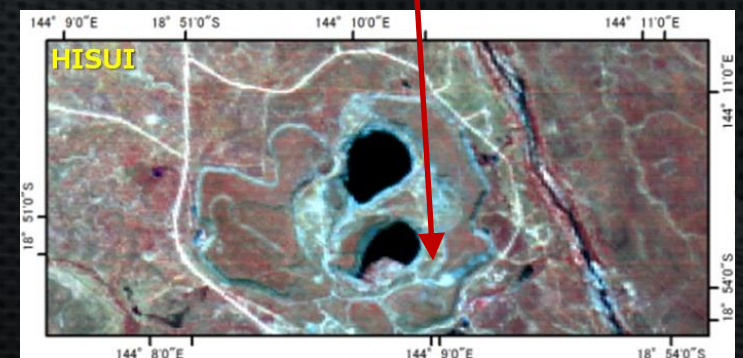
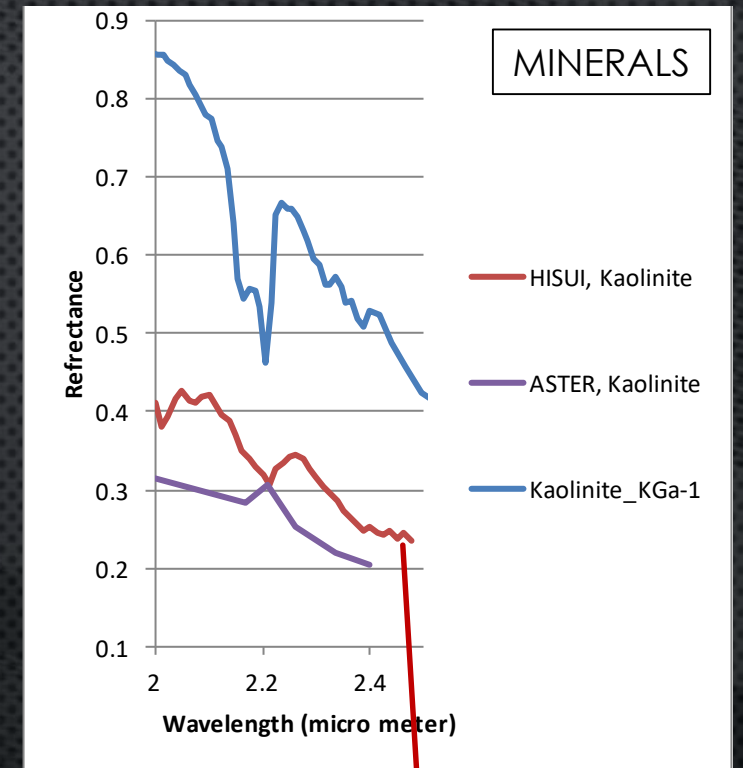
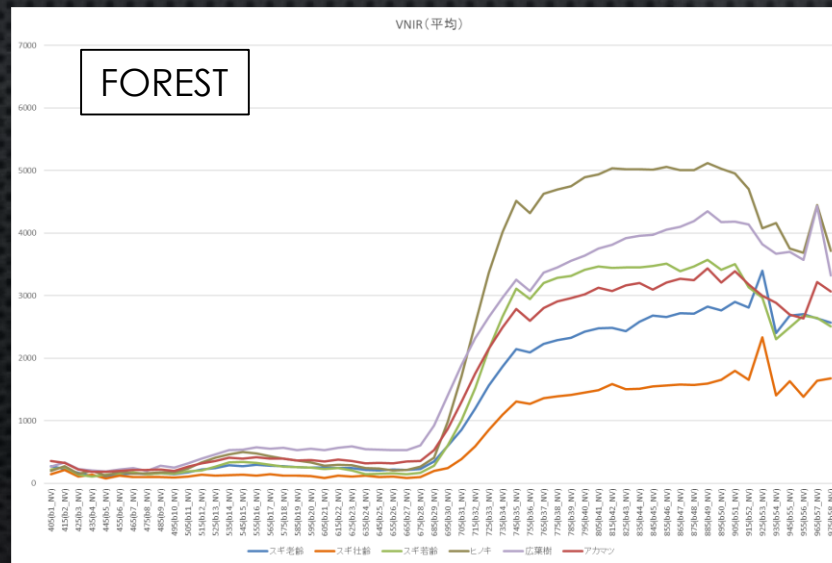
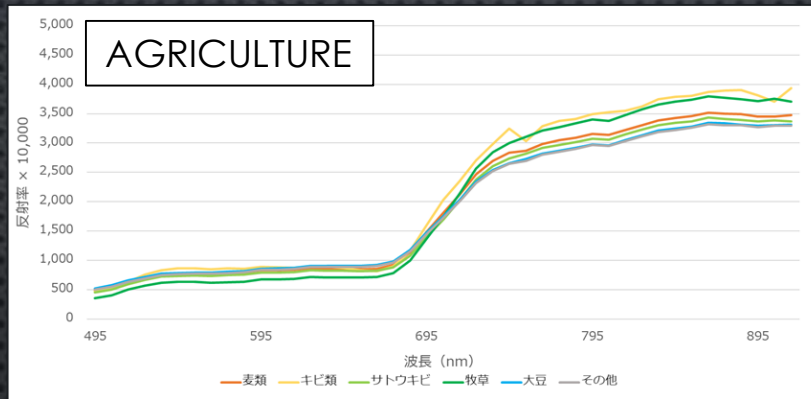
Colors indicate the numbers of scheduled observation.



# SPECTRA



Spectral transmittance of SRM2035a wavelength calibration filter measured by HISUI on Sept. 11, 2020 (Urai et al., TH4.O-17.1, IGARSS 2021)





# CONTACT

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About HISUI Research Announcement :

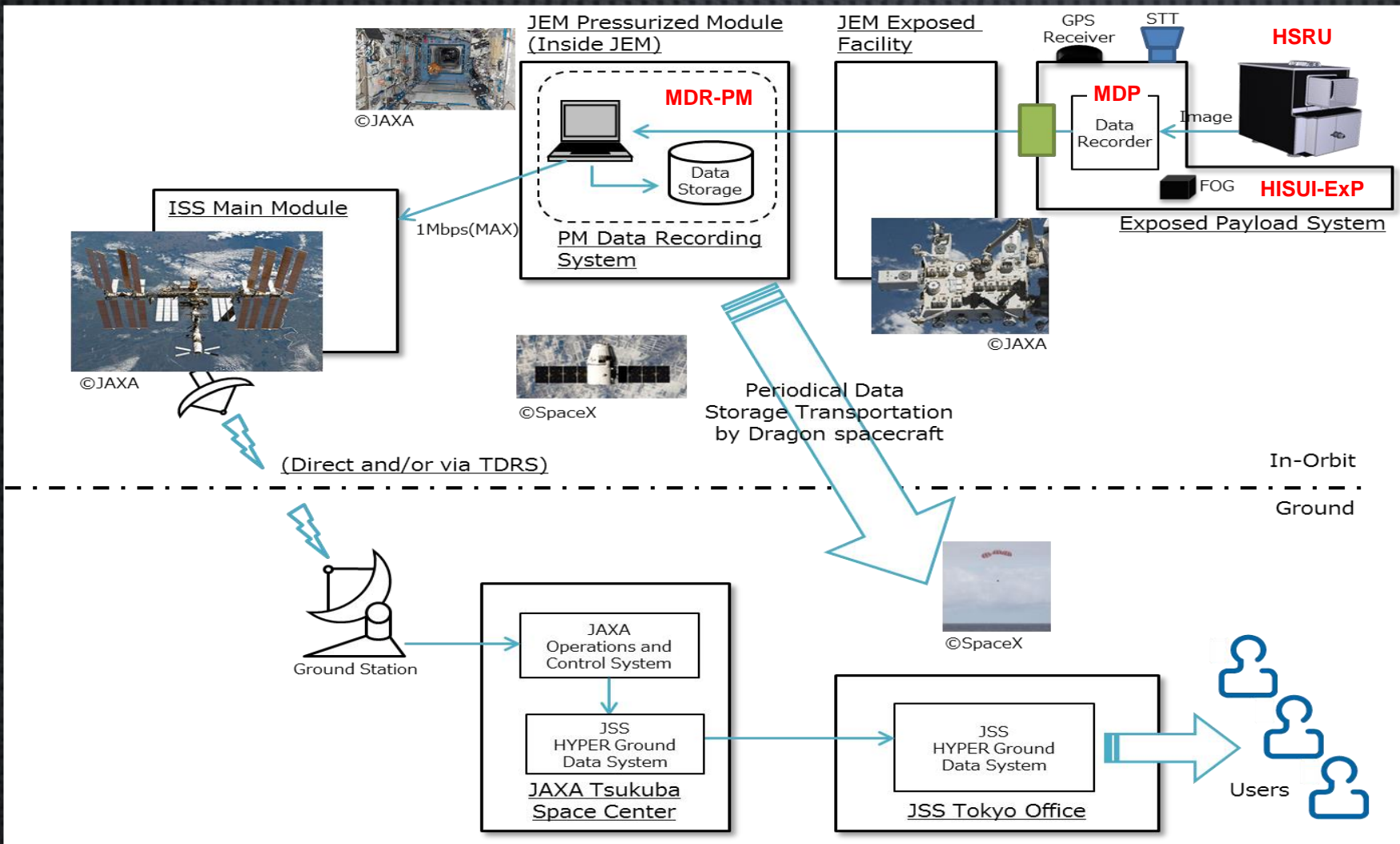
hisui\_application@jspacesystems.or.jp

<https://www.jspacesystems.or.jp/en/project/observation/hisui/>

The delivery of HISUI data to Research Announcement users  
will start in **December 2021**.



# HISUI DATA FLOW



1) HISUI has its own data receiving, storing, and sending devices on JEM EF and JEM PM.

2) HISUI data sent from EF device are recorded on the removable media in MDR-PM. ( $\approx 300$  GB/day)(TBD). After recording, the media are planned to be shipped from ISS to the ground 3 or 4 times per year (TBD). In addition, the limited amount of HISUI data are transmitted from ISS to the ground station in near-real time.