Jet Propulsion Laboratory
California Institute of Technology

ECOSTRESS

ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station

Project Manager Overview and Build 7.0 Notes
Science Team Meeting
17 August 2021

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ECOSTRESS Expands Coverage from 8 to 12 Consecutive Scenes

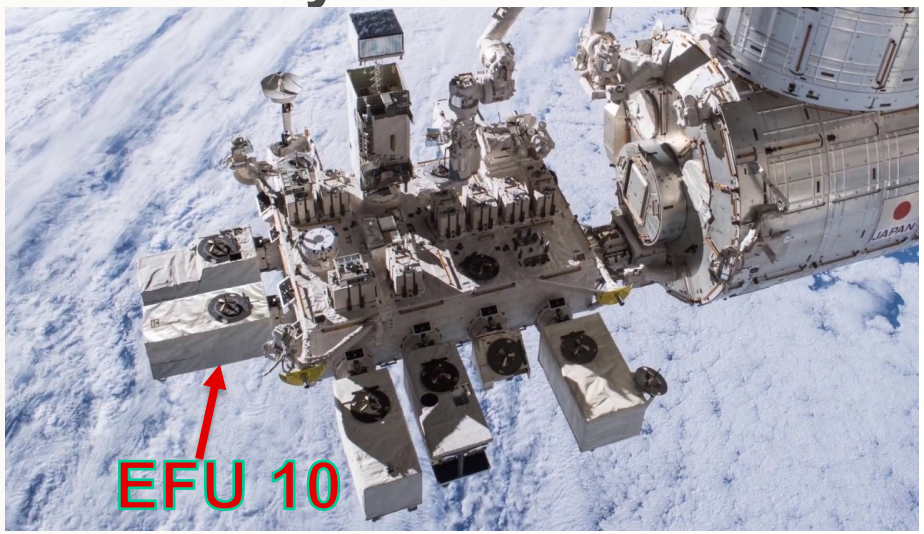
The DPU-IO 3.0 firmware update uploaded to the payload 14 May 2021 has been operational (uncompressed mode only) since 6 June 2021.

Starting 15 July 2021 (UTC), data acquisitions of 12 consecutive scenes have been sequenced and acquired as part of nominal science operations (exceeding the goal of 10 consecutive scenes) for the first time since the loss of the Mass Storage Unit in March 2019.

ECOSTRESS Can Stay!

ECOSTRESS was scheduled for decommissioning in Oct 2021 but has been **officially extended through September 2023!**

ECOSTRESS is the only multi-spectral thermal radiometer in space ahead of SBG.



New Products Coming Soon

Science Data System Build 7.0 is scheduled to be deployed to operations early FY2022.

We have comprehensively revised the ECOSTRESS data products with improved algorithms and a new more accessible data format.

In Collection 2, we will distribute the products at 70 m spatial resolution in 100 x 100 km Sentinel tiles in UTM projection, using the Landsat file format, Cloud-Optimized GeoTIFF.

These products will contain additional key data layers required for modeling surface energy balance, including NDVI, albedo, soil moisture, air temperature, humidity, and net radiation.

The development of these improved algorithms and **implementation of these tiled data products demonstrates a feasible and cloud-enabled work-flow for the future SBG suite of surface energy balance products.**

ECOSTRESS Expands Coverage from 8 to 12 Consecutive Scenes

- DPU-IO 3.0 firmware update features enabling the acquisition of 10 and more consecutive scenes include:
  - Optimization of how the data is stored on the SDRAM
  - Improvement of the SDRAM read/write pointers to allow the memory to be treated as a ring buffer
  - Downlinking of data between acquisitions without need to downlink all buffered data
  - Simultaneous Acquisition and Transmission, allowing downlinking of data while acquiring
- Providing:
  - End-to-end pass coverage of CONUS for the first time since the loss of the Mass Storage Unit in March 2019
  - The groundwork necessary for the development of a DPU-IO firmware update to acquire 5 bands – planned for FY22

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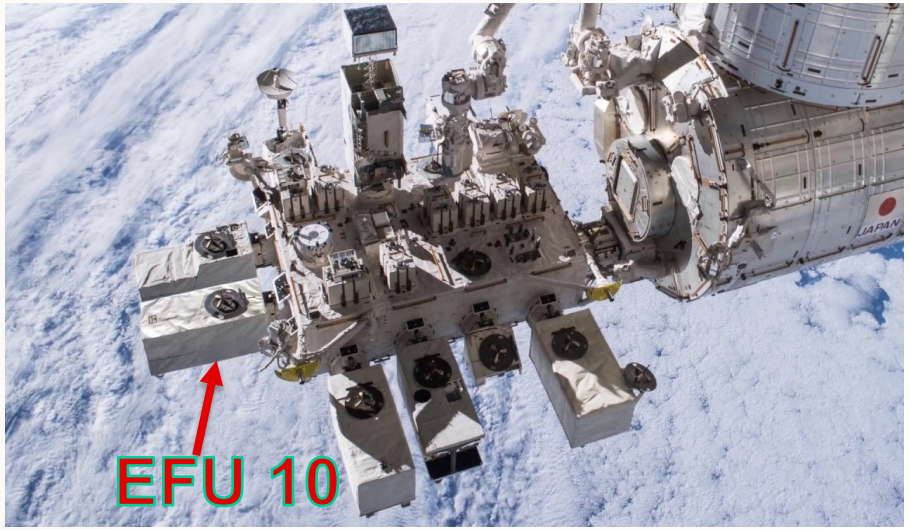

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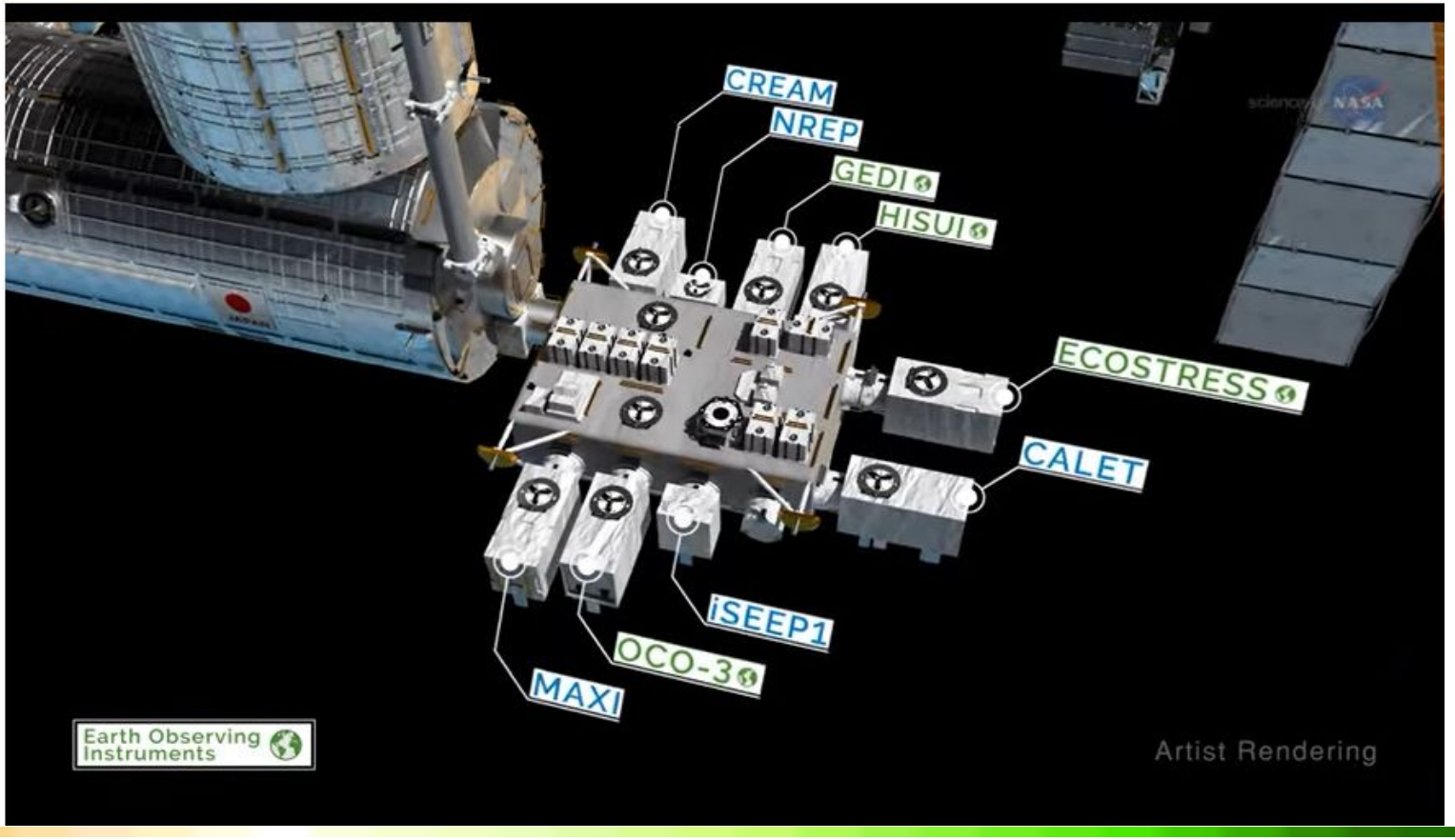
Eyes on Earth

- The space station affords a unique planetary perspective with an orbital path passing over 90 percent of the Earth's population. Its approximately 52 degrees of orbital inclination allows astronauts and Earth-observing payloads to see the sun rise and set 16 times each day across the world.
- "That orbit allows the space station to pass over different spots of Earth at different times of day or night and collect data. It is a fundamentally different data set than most other remote sensing instruments collect on free-flying satellites," says Stefanov.

A diagram of the Earth-observing payloads currently mounted off the side of the Japanese Experiment Module. Credits: NASA

How Scientists Are Using the International Space Station to Study Earth's Climate
https://www.nasa.gov/mission_pages/station/research/news/scientists-using-iss-study-earth



NASA ScienceCasts: Keeping an Eye on Earth
https://www.youtube.com/watch?v=9XIBNC7mtIs

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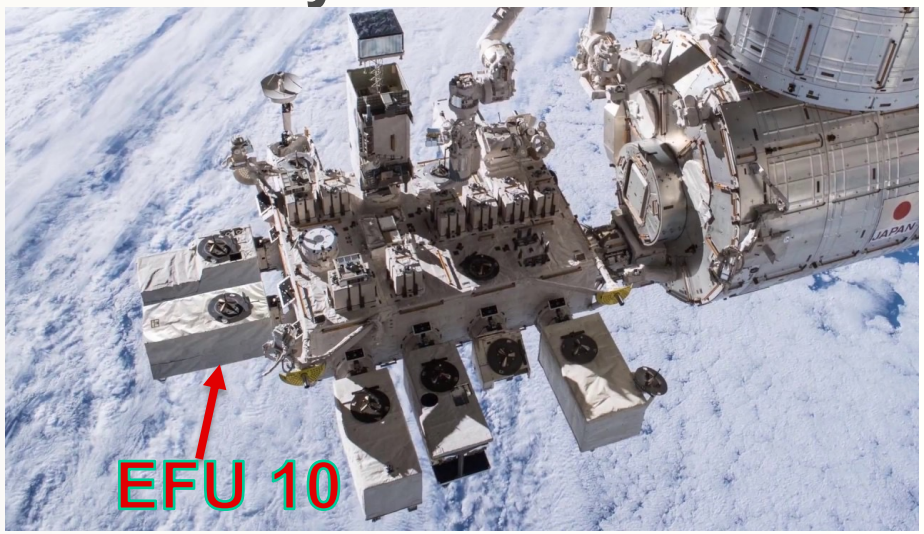

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Data Collection Comparison

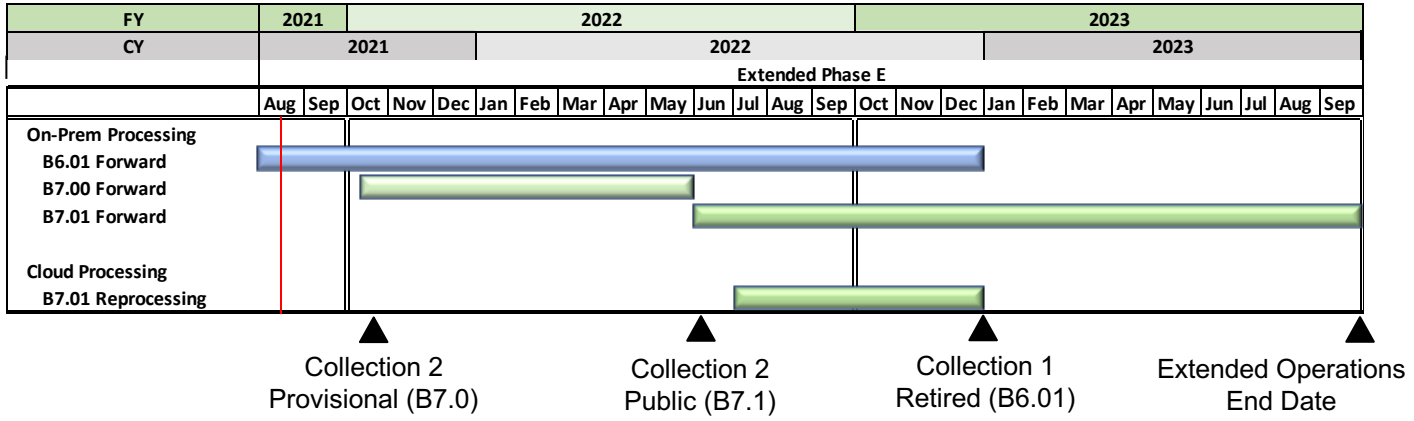
	Collection 1 (B6.01)	Collection 2 (B7.x)
Product Format	400 km x 400 km scenes in geolocated swath projection, HDF5	• L1 – L2: 400 x 400 km scenes in geolocated swath projection, HDF5 • L2 – L4: 400 x 400 km scenes, gridded, HDF5 • L2 – L4: 100 x 100 km Sentinel tiles in UTM projection, using the Landsat file format, Cloud-Optimized GeoTIFF
Compressed	No	Yes (expect ~50% smaller files)
Distribution	Public	• B7.0 Provisional only (select users) • B7.1 Public
Lifecycle	Retired when full data record is processed to B7.1	B7.1 forward processing continues to operations end in current plan

Would you like to help us review / analyze the B7.0 provisional products?
Please email Kerry:
Kerry-Anne.Cawse-Nicholson@JPL.NASA.gov

SDS B7.0 Capabilities

1. Cloud-enabled Science Data System (SDS) allowing for hybrid processing (on-premise and Cloud) and enabling reprocessing of 4 years of data in 6 months.
2. Improved geolocation matching accuracy
3. New products that contain additional key data layers required for modeling surface energy balance
4. New scene level QA flags
5. Improved Level 2 cloud mask and new water mask

Data Collection Schedule



Thank you!

ECOSTRESS Data: Quick Facts and Stats

As of 8/8/2021, 207,238 scenes have been acquired since launch, an area that is about 222 times the area of the Earth's land surface

In the last quarter, ECOSTRESS surface temperature and evapotranspiration were among top 10% of most requested products from LP DAAC AppEEARS which hosts MODIS and Landsat products

We originally planned to acquire an average of 74 scenes per day but have now acquired an average of 216 scenes per day.

Highest spatial resolution multispectral thermal infrared radiometer NASA has ever built

Only spaceborne instrument capable of providing data suitable for evaluating data for the Decadal Survey SBG TIR mission.

We originally planned to acquire 27,010 scenes over a 1-year Mission and have now acquired 7.6x the number of planned scenes.

Successful negotiations between ISS and JAXA have secured JEM-EF site 10 for ECOSTRESS until January 2023.

In addition, JAXA recently made a preliminary assessment that allows ECOSTRESS to stay on JEM EFU 10 until September 2023!