

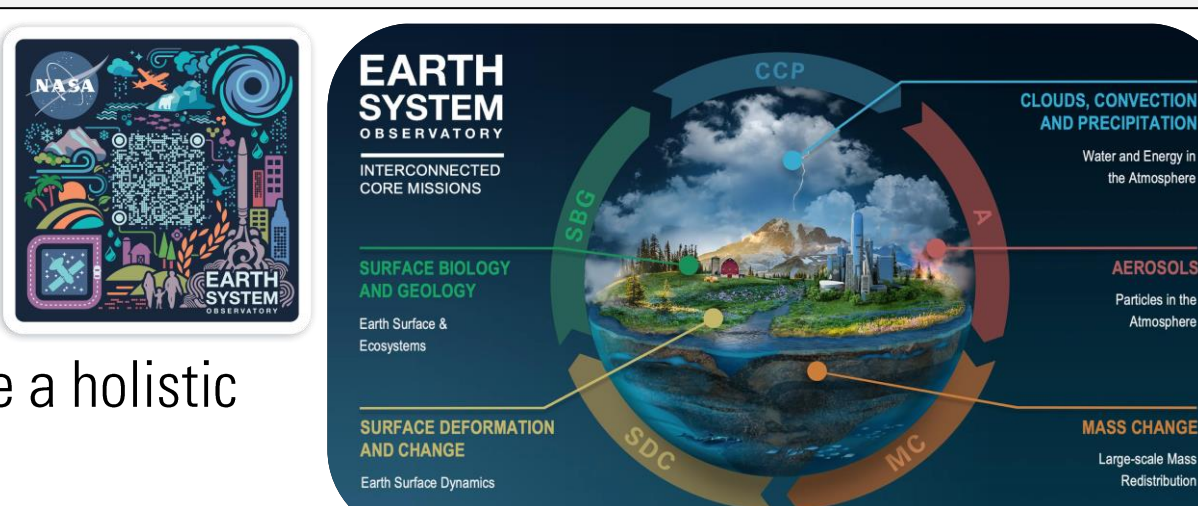
Pre-SBG: Preparing Surface Biology and Geology Users for Global Imaging Spectroscopy and Thermal Infrared Data in the Era of Open Science in the Cloud

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About SBG

NASA is designing a new set of Earth observation missions to provide information to guide efforts related to climate change, natural hazard mitigation, fighting forest fires, and improving real-time agricultural processes, referred to as the Earth System Observatory (ESO). Each mission in the ESO will complement the others, working to create a holistic 3D view of Earth, from bedrock to atmosphere.



The Surface Biology and Geology (SBG) ESO mission is anticipated to launch later this decade. SBG will usher in a new era of imaging spectroscopy and thermal infrared measurements, providing higher spatial, temporal, and spectral resolution data with lower latency and more frequent revisits than have been available at the global scale to date.

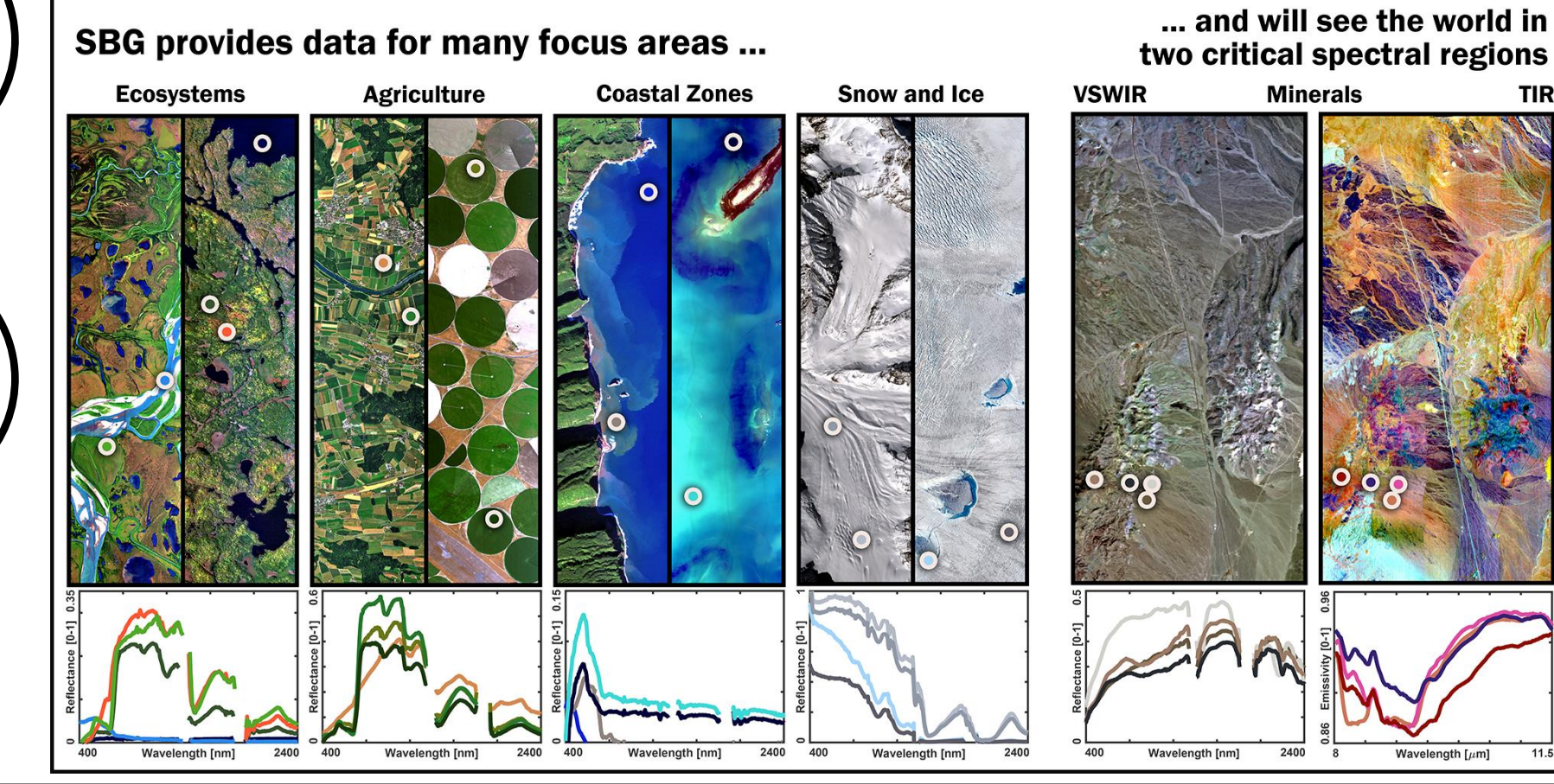
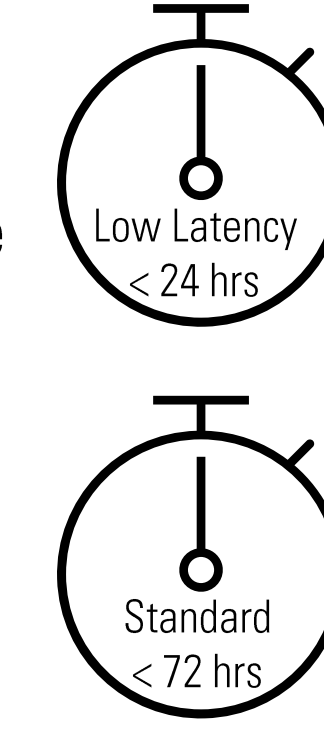
Pathfinder projects are critical to the success of SBG and support a host of mission-specific elements. In anticipation of SBG, the Space-based Imaging Spectroscopy and Thermal pathfinder (SISTER) project is actively utilizing existing airborne and spaceborne sources to prototype workflows that span terrestrial ecosystems, inland and coastal aquatic ecosystems, hydrology, and geology. The SBG High Frequency Timeseries (SHIFT) campaign includes unique precise, high-repeat-frequency airborne flights on plant and aquatic communities. These and other activities support efforts to mature workflows, algorithms, and data products envisioned for SBG. They provide previously unavailable context for orbital temporal and spatial resolutions, lay the groundwork to develop a robust cal/val network, and build a user community ahead of launch. NASA's Land Processes Distributed Active Archive Center (LP DAAC) and Oak Ridge National Laboratory (ORNL) DAAC have started archiving and distributing pre-SBG pathfinders and airborne campaigns and are involved in activities to support and enable SBG user communities as they prepare for the prime mission.

- ### Notional SBG Specs:
- SBG-TIR**
- 3-day revisit
 - 60 m spatial resolution*
 - Global Coverage
 - Coincident 30 m VNIR from the Italian Space Agency (ASI)



- SBG-VSWIR**
- 16-day revisit
 - 30 m spatial resolution*
 - Global Coverage
 - High Spectral Resolution
- *1000 m binned over the open oceans

- ### Potential Products:
- Radiance
 - Surface Reflectance
 - Emissivity
 - Land Surface Temperature
 - Cloud Mask
 - Surface Fractional Cover
 - Evapotranspiration
 - Water Use Efficiency
 - Evaporative Stress Index
 - Aquatic Products
 - Snow Products
 - Terrestrial Vegetation Products
 - Geology and Soils Products
 - Volcanic Products



Pathfinders

Pathfinder Projects
 Mature workflows, algorithms, and data products envisioned for SBG and in turn build a vigorous and expansive user community through open source and open standards ahead of launch.

Space-based Imaging Spectroscopy and Thermal Pathfinder (SISTER)

- Pathfinder project aimed at prototyping, describing, and providing analysis workflows and tools which generate SBG-like data products utilizing existing airborne and spaceborne sources. The DAACs and the SISTER team are working together to publish and openly share the scientific workflows, algorithms, and experimental data.

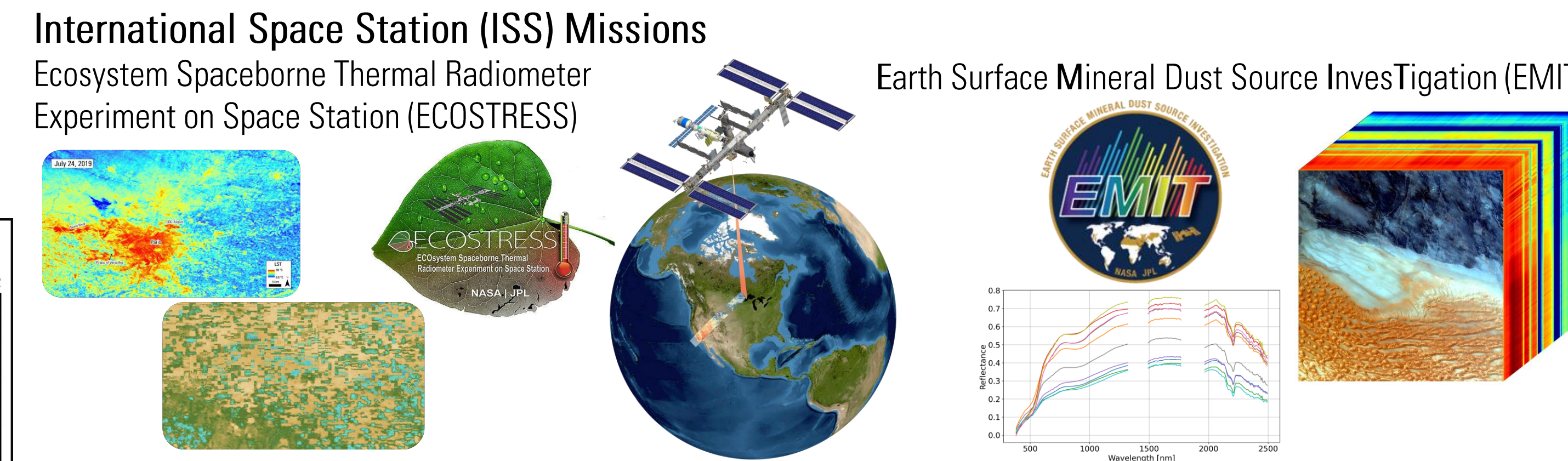
SBG High Frequency Time Series (SHIFT)

- Field and airborne campaign whose study area was in Santa Barbara County and the coastal Pacific waters. SHIFT collected a weekly dense time series of airborne VSWIR image spectroscopy with coincident field measurements to enable a traceability analyses of the value of VSWIR revisit and enabled algorithm testing over seasonal time scales. The DAACs are working with the SHIFT team and the community to identify an optimal approach to organizing and storing high-frequency imaging spectroscopy data to better support analysis in the cloud.



Airborne Data
 Airborne Visible InfraRed Imaging Spectrometer (AVIRIS)
 Hyperspectral Thermal Emission Spectrometer (HyTES)

Modeled Data
 LPJ-PROSAIL Global Simulated Dynamic Surface Reflectance



EOS to ESO: Building on a Legacy of Excellence

- Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER)
- MODerate Resolution Imaging Spectroradiometer (MODIS)
- Visible Infrared Imaging Radiometer Suite (VIIRS)
- Landsat

Resources

VITALS
 VSWIR Imaging and Thermal Applications, Learning, and Science GitHub Repo
 Resources from the "Space Station Synergies: Applying ECOSTRESS and EMIT Data to Ecological Problems for Scientific Insight" AGU Workshop

NASA OpenScapes
 NASA Earthdata-OpenScapes answers a call to support scientific researchers using data from NASA DAACs as they migrate workflows to the cloud. Includes a NASA OpenScapes 212c-managed Jupyter Hub that is used to support workshops and hands-on, interactive learning.

EMIT

- EMIT Open-Source Processing Code: github.com/emit-sds
- EMIT Tutorials: github.com/nasa/EMIT-Data-Resources

ECOSTRESS github.com/nasa/ECOSTRESS-Data-Resources

Repository Contents

Repository Contents	Type	Summary
ECOSTRESS_Tutorial_jupyter	Jupyter Notebook	Demonstrates how to work with the ECOSTRESS Evapotranspiration (ET) - JPL Daily L3
ECOSTRESS_swath2grid.py	Command Line Executable	Demonstrates how to convert ECOSTRESS swath data products into projected GeoTIFFs

LP DAAC General Resources lpdaac.usgs.gov/resources/a-learning/

This repository is a place to find data user resources that demonstrate how to use LP DAAC tools, services, and data. Content includes in this repository are listed below.

Repository Contents	Type	Summary
Data Discovery_CMR_API_Request(jupyter)	Jupyter Notebook	Demonstrates how to search for Earthdata data collections and granules using CMR API and Request Python package
bulk_download_using_curl.py	Markdown	Demonstrates how to bulk download LP DAAC data using Curl from command line
bulk_download_using_wget.py	Markdown	Demonstrates how to bulk download LP DAAC data using Wget from command line

The other guides, tutorials, how-toos and scripts can be accessed in our mission specific repositories.

ORNL DAAC General Resources

<https://daac.ornl.gov/>

Future

- Nov 28, 2023: Released LPJ-PROSAIL Global Simulated Dynamic Surface Reflectance Version 1
 - Dec 2023: ECOSTRESS Level 3 ET and Level 4 Evaporative Stress Index and Water Use Efficiency Version 2 Release
 - Feb 6-8, 2024: SBG Community Workshop in Washington, DC—includes ECOSTRESS-EMIT Workshop
 - Winter 2024: EMIT Application for Extracting and Exploring Analysis Ready Samples (AppEARS) Public Release
 - Jul 7-12, 2024: International Geoscience and Remote Sensing Symposium (IGARSS) EMIT Workshop
 - Aug 4-9, 2024: Ecological Society of America (ESA) Annual Meeting Workshop
 - 2024:
 - EMIT Version 2 Release
 - LPJ-PROSAIL Version 2 Release
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Get Involved!

- Sign up for SBG Working Groups: <https://sbg.jpl.nasa.gov/groups>
 - Applications, Algorithms, Modeling, Calibration & Validation
 - Join the SBG VSWIR Science & Applications Email List: <https://tinyurl.com/yv3edwfw>
 - Sign up for the LP DAAC Listserv: Send a blank email to lpdaac-join@lists.nasa.gov
 - Pre-Enroll in the NASA TOPS Open Source Science 101 Course and subscribe to the TOPS newsletter
 - <https://nasa.github.io/Transform-to-Open-Science/signup/>
 - Check out future workshop opportunities!
 - Check out our resources on GitHub and contribute
 - Post questions to the NASA Earthdata Forum: <https://forum.earthdata.nasa.gov/>
 - Follow NASA Earthdata on social media
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What do you need to prepare for SBG?

<https://lpdaac.usgs.gov/lpdaac-contact-us/>