Fundamentals to use Hyperspectral and Thermal NASA Earth Observations

July 21,22, 2025
Online

Abstract:

The new generation of NASA Earth Observations (EO) is bringing unprecedented spectral and temporal resolution, marking a new era for satellite remote sensing. This advancement promises to greatly benefit society by providing richer information on Earth's resources and environmental changes.

This two-day webinar is designed for researchers, scientists, and data analysts eager to leverage this wealth of information. We will cover the fundamentals necessary to work with NASA's high-spectral resolution EO data, spanning the Visible to Short-Wavelength Infrared (VSWIR) and Long-Wavelength Infrared (LWIR) parts of the electromagnetic spectrum. The webinar will delve into: measurement acquisition, standard preprocessing methods, and data discovery and handling for key datasets like the Earth Surface Mineral Dust Source Investigation (EMIT), ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS), and Plankton, Aerosol, Cloud, Ocean Ecosystem (PACE) missions. We will also include tutorials on how to synergistically use these EO datasets. These hands-on exercises will utilize open-source code and cloud platforms, specifically Python in JupyterHub cloud infrastructure and JavaScript in Google Earth Engine (GEE).

Learning objectives:

- Understand the fundamentals of hyperspectral imaging and thermal measurements through reviewing the electromagnetic spectrum and sensor specific considerations.
- Learn how to utilize hyperspectral VSWIR and multispectral TIR datasets for a variety of Earth science applications and research interests.
- Discover and practice downloading, visualizing, and manipulating VSWIR and TIR datasets in cloud environments.

Prerequisites:

1. Sign up for a GEE account. For this training you can use the non-commercial license agreement.
2. Configure a Google Cloud Project for GEE.

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Time (EST)	Time (PST)	Description	Lead/Instructor
1:00 pm - 1:20pm	10:00 - 10:20am	Introduction, overview, learning objectives, and logistics of the webinar	Africa Flores-Anderson
1:25pm - 1:50pm	10:25-10:50am	EMIT and ECOSTRESS Applications	Christine Lee Dana Chadwick
1:50-2:20pm	10:50 - 11:20am	PACE Applications	Morgaine McKibben
2:20 - 2:35pm	11:20 - 11:35am	Questions/Answers (break)	
2:35 - 3:20pm	11:35-12:20pm	VSWIR Hyperspectral Imaging and SBG VSWIR	David Thompson
3:20 - 4:05pm	12:20 - 1:05pm	Thermal Remote Sensing and SBG TIR	Glynn Hulley
4:05 - 4:35pm	1:05 - 1:35pm	Description of resources to use: Openscapes and cloud access	Erik Bolch
4:35-5:00pm	1:35-2:00pm	GEE Platform overview	Emil Cherrington
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1:00-1:30pm	10:00-10:30am	Start-up cloud environments	Erik Bolch & Emil Cherrington
1:30 - 2:15pm	10:30 - 11:15am	TIR exercise - Land Surface Temperature:	Ayia Lindquist, Erik Bolch/Mahsa Jami
2:15pm - 3:00pm	11:15 - 12:00pm	Hyperspectral VSWIR exercise - Land: Visualizing SBG VSWIR data EMIT & ECOSTRESS Coregistration tutorial	Ayia Lindquist, Erik Bolch, Mahsa Jami
3:00 - 3:15pm	12:00-12:15 am	Break	

3:15 - 4:00 pm	12:15-1:00pm	EMIT and PACE Coregistration tutorial and application example over land	Africa Flores-Anderson, Erik Bolch, Mahsa Jami
4:00 - 4:45 pm	1:00pm - 1:45pm	Hyperspectral in GEE - Land: EMIT/PACE/AVIRIS	Emil Cherrington, Africa Flores-Anderson
4:45-5:00pm	1:45-2:00pm	Q&A and survey	Africa Flores/Emil Cherrington

Learning Outcomes:

- Imaging Spectroscopy and thermal measurements 101, the electromagnetic spectrum and sensor specific considerations
- How to access EMIT, PACE and ECOSTRESS data
- Data Preprocessing and Exploratory Analysis
- How to manipulate, combine, and visualize EMIT, PACE and ECOSTRESS data

Learning Focus:

Practical Skills for Science

Knowledge & Career Level:

Beginner, Intermediate

Target Audience:

- Earth and Planetary Surface Processes
- Global Environmental Change
- Science and Society
- Biogeosciences