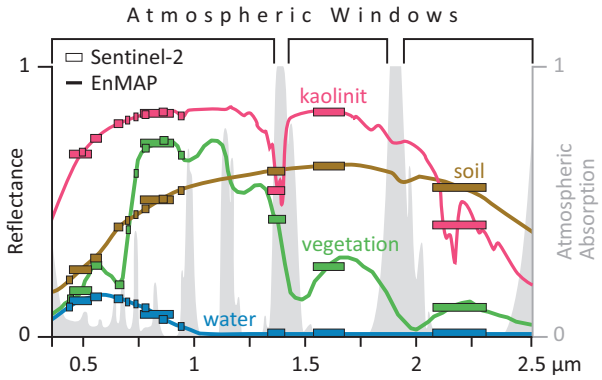
Mission and Instrument Overview

Orbit characteristics		
Orbit / Inclination	sun-synchronous / 97.96°	
Target revisit time	27 days (VZA ≤ 5°) / 4 days (VZA ≤ 30°)	
Equator crossing time	11:00 h ± 18 min (local time)	
Instrument characteristics	*VNIR*	*SWIR*
Spectral range	420 - 1000 nm	900 - 2450 nm
Number of bands	88	154
Spectral sampling interval	6.5 nm	10 nm
Spectral bandwidth (FWHM)	8.1 ± 1.0 nm	12.5 ± 1.5 nm
Signal-to-noise ratio (SNR)	› 400:1 @495 nm	› 170:1 @2200 nm
Spectral calibration accuracy	0.5 nm	1 nm
Ground sampling distance	30 m (at nadir; sea level)	
Swath width	30 km (field-of-view = 2.63° across track)	
Acquisition length	1000 km/orbit - 5000 km/day	

The position and shape of spectral absorption bands reveal the identity of materials at the Earth's surface, whereby the depth of the relevant bands correlates with the areal concentration of the materials in question. This physical basis in turn allows new analytic approaches that were so far not possible with multispectral data.



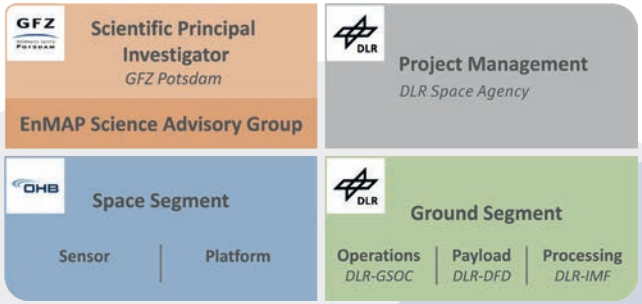
Hyperspectral vs multispectral imaging for selected types of surface cover

Scientific Principal Investigator

Sabine Chabrillat (GFZ German Research Centre for Geosciences, Leibniz University Hannover) supported by the EnMAP Science Advisory Group (EnSAG)

Mission Management

Sebastian Fischer (DLR Space Agency)



Schematic overview of the project organization

Funding

The project is financed by the German Federal Ministry for Economic Affairs and Climate Action with contributions from OHB System AG, GFZ and DLR.

Supported by:

Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

www.enmap.org

Image credits:

GFZ Potsdam, OHB System AG, DLR, Trier University

03/2022

EnMAP Hyperspectral Imager

Environmental Mapping and Analysis Program

Exploring the Earth's Ecosystems on a Global Scale

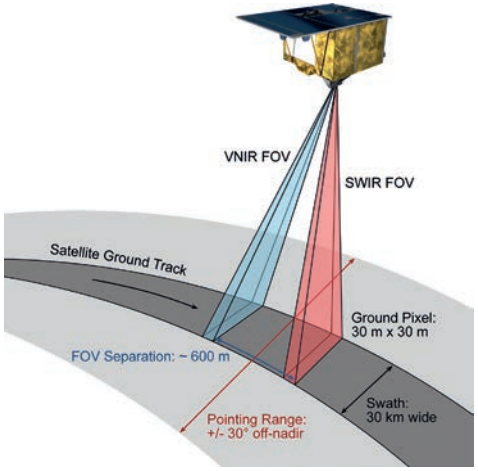
Mission Goals and Preparatory Science

The Environmental Mapping and Analysis Program (EnMAP) is a German hyperspectral satellite mission that aims at monitoring and characterizing the Earth's environment on a global scale.

EnMAP will provide quantitative surface parameters on the status of terrestrial and aquatic ecosystems and the changes they undergo. More specifically, the primary goals are to investigate globally interconnected environmental processes and changes, to study the diverse effects of human intervention in ecosystems and to support the management of natural resources. By supplying a basis for quantifying and modeling crucial ecosystem processes, EnMAP will make a major contribution toward understanding the complexities of the Earth System.

The EnMAP mission includes two imaging spectrometers recording light from the visible to shortwave infrared in more than 240 narrow spectral bands. EnMAP will have a ground resolution of 30 m x 30 m and a revisit time of 27 days (off-nadir four days).

Algorithms devised during the preparatory phase are made freely accessible in the EnMAP Box, a newly developed software package. To test the developed methodologies, a simulation software for generating realistic EnMAP-like data was developed, while measurements gathered in extensive preparatory airborne campaigns are being used as input. In addition, the online learning initiative HYPEREdu is being developed to train students and professionals in hyperspectral remote sensing.



Representation of an EnMAP overpass

Overarching Research Themes

EnMAP's repeated observations with an advanced spectral coverage and resolution will open up new horizons in ecosytem research and in resource and disaster management. The following overarching science questions were identified, to which EnMAP is destined to make significant contributions.

Climate Change Impacts and Measures

- How does climate change affect state, composition and seasonal cycles of terrestrial and aquatic ecosystems?
- What measures can effectively combat climate change, and how can their implementation be monitored?

Land Cover Changes and Surface Processes

- Where and to what extent do land degradation processes and land use / land cover changes occur from local to global scale?
- Which processes drive land degradation, and how efficient are countermeasures?
- What are the consequences of land degradation and land use/ land cover changes in view of food security and environmental sustainability?

Biodiversity and Ecosystem Processes

- What is the spatial pattern of ecosystem and diversity distributions from local to global scale?
- How do ecosystems change over time in their composition and health?
- How are ecosystem processes affected by human activities or natural causes, and how can harmful consequences on their biodiversity be reduced or prevented?

Water Availability and Quality

- Which areas are affected by water scarcity and water quality problems from local to global and from seasonal to decadal scales?
- How do climate change and human activities, such as intensive agriculture, water demanding industries and high population density, reinforce water scarcity and water quality problems?

Consequences of overgrazing in the Albany Thicket Biome (South Africa)

Natural Resources

- How can natural resources, such as mineral deposits, energy sources and ground water sources, be explored and managed in a sustainable way?
- What impact do human activities, such as industry, mining and agriculture, have on natural resources?
- How can environmentally harmful impact, such as water and air pollution, land contamination and mine waste, be tracked, monitored and managed in order to conserve and sustain natural resources?

Hazard and Risk Assessment

- Which areas are to what extent vulnerable to natural and man-made hazards?
- In case of a natural or man-made disaster, which areas are to what extent affected?