

The EnMAP Hyperspectral Imager – An Advanced Optical Payload for Earth Observation

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ABSTRACT

The Environmental Mapping and Analysis Program (EnMAP), a German hyperspectral mission, currently in phase C/D, is scheduled for launch in 2013. The primary goal of EnMAP is to offer accurate, diagnostic information on the state and evolution of terrestrial ecosystems on a timely and frequent basis, and to allow for a detailed analysis of surface parameters with regard to the characterisation of vegetation canopies, rock/soil targets and coastal waters on a global scale. EnMAP is designed to record bio-physical, bio-chemical and geo-chemical variables to increase our understanding of biospheric /geospheric processes and to ensure the sustainability of our resources.

EnMAP will sample areas of 30 x 30 km² with a ground sampling distance (GSD) of 30 m, measuring in the 420-2450 nm range by means of two separate spectrometers covering the visible to near-infrared (VNIR) and short-wave infrared (SWIR) spectral regions. The mean spectral sampling distance and resolution is of 6.5 nm at the VNIR, and of 10 nm at the SWIR. Accurate radiometric and spectral responses are guaranteed by a required signal-to-noise ratio (SNR) of about 500:1 in the VNIR and about 150:1 in the SWIR, a radiometric calibration accuracy better than 5% and a spectral calibration uncertainty of 0.5 in the VNIR and 1 nm in the SWIR. An off-nadir pointing capability of up to 30° enables a target revisit time of 4 days.

Scientific activities have been focused on the support of industrial developments and the consolidation of the mission concept. A scene simulator accounting for instrumental and environmental parameters has been implemented for that purpose. It enables the definition of optimal instrument configurations for radiometric, spectral and geometric parameters. In addition, an EnMAP-specific software environment for the interactive processing of EnMAP data is being designed. Tools for the pre-processing of EnMAP data and the derivation of higher-level bio-physical products are to be included in such software. Furthermore, a plan for calibration and validation activities is also under development. It will define the strategy for the support of in-flight calibration devices with vicarious calibration and validation activities, as well as the interaction between EnMAP and other co-existing Earth observation missions for calibration and scientific purposes.

The presented paper describes the instrument and mission, highlighting the efforts and results of ongoing activities and studies and provides up-to-date information to potential users.