IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Data Management Systems (4)

Author: Mr. Leonardo Amoruso
Planetek Italia, Italy

Mrs. Francesca Santoro
Planetek Italia, Italy
Mr. Luigi Agrimano
Planetek Italia, Italy
Mr. Nicolo Taggio
Planetek Italia, Italy
Mr. Ettore Lopinto
Italian Space Agency (ASI), Italy
Dr. Cristoforo Abbattista
Planetek Italia, Italy

LEVEL 2 AUTOMATIC PROCESSOR IN THE PRISMA HYPERSPECTRAL MISSION

Abstract

PRISMA is a mission funded by the Italian Space Agency and based on the Italian Industries state of art technologies. The satellite has been launched in March 2019 and after commissioning and calibration, the mission now entering its operational phase. PRISMA is a small class satellite in LEO SSO orbit equipped with an electro-optical payload composed by a pushbroom Imaging Spectrometer, able to acquire data in a continuous region ranging from 400 to 2500 nm, and a medium resolution panchromatic Camera. The hyperspectral imager, thanks to the prism dispersion element, collects 239 spectral bands, 66 in VNIR and 173 in SWIR with a ground sampling distance of 30m30 m. The panchromatic camera acquires in the 400-700 nm range with a nominal ground sampling distance of 5 m 5 m at nadir. The mission is the first operative hyperspectral imager and is designed to support a wide range of Earth Observation applications. So novel technological solutions have been adopted also in the payload data processing chain on ground, in order to satisfy applications' needs. Products levels available to end users are PRISMA Level 1, providing the Top Of Atmosphere (TOA), radiometrically calibrated HYP and PAN radiance images and Level 2, providing geo-located (L2b, L2c) and geo-coded (L2d) atmospherically corrected surface radiance and reflectance images together with atmospheric constituent maps (aerosols, water vapour, cloud optical thickness). The highest level produced by the chain is L2d, providing the geocoded reflectance images in UTM projection, obtained applying the geometric model (also included L2b and L2C), with the support of a terrain elevation model. In designing and implementing the L2 processor, two main drivers have been set: guaranteeing products' final quality performances and adopting an automated approach to production in order to keep low operational costs and the highest production volume without any quality compromise. Main issues came from evaluating corrections automatically: the atmospheric one, on spectral windows not usually acquired in other missions, and the geometric one compensating the acquisition geometry. The atmospheric inversion model is evaluated using precomputed Look-Up-Tables covering different atmospheric and geometry conditions, allowing for automatic selection of simulated data needed in operational case. The geo-coding model is estimated on the image using satellite position and pointing and enhanced using the precise knowledge of ground control points, whose position in the image is recognized with an automatic procedure. The "GCP matching" exploits a GCPs' database and a custom algorithm specifically designed to this aim. The results demonstrate an overall

radiometric accuracy below 5