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HYPERSPECTRAL PROTOTYPE PRODUCTS FOR USER EXPLOITATION OF PRISMA AND FUTURE HYPERSPECTRAL SATELLITE DATA

Abstract

The Italian Space Agency (ASI) has long been active in the hyperspectral field through significant investments such as in the case of the PRISMA mission, a national Earth Observation program fully funded by ASI, or the Italo-Israeli joint mission SHALOM. In this context, the ASI project "Development of hyperspectral advanced prototype products" (ASI Contract n. 2021-7-I.0) is aimed at the design, development, test and validation of eight prototypes, useful for the generation of different geospatial layers on the basis of satellite hyperspectral data, in particular PRISMA data and in future SHALOM data. The project consists of three macro-phases: • consolidation of prototype technical specifications and related design • testing of hyperspectral data processing algorithms and development of software prototypes • qualification of prototypes and quality validation of the added-value products The main objective of the project is to define the development plan for the following subset of L3 / L4 value-added products: - Vegetation Status Indicators provide for each hyperspectral image the following information layers: Leaf area index, Fraction of absorbed photosynthetically active radiation, Fractional vegetation cover, Leaf chlorophyll content. - Water Quality provides the following parameters: Phytoplankton, Total Suspended Matter, Bottom Substrate. - Fire Severity Map reports a classification of the burnt areas, based on the severity of the environmental changes caused by the fire. - Fire Fuel Map provides a map of fuel type of the underlying vegetation according to the Northern Forest Fire Laboratory fuel model (13 categories). - Forest Fire Front product reports the localization of active fires, based on the ionization at flaming temperature of the Potassium contained in biomass burning. - Volcanic Parameters product concerns the characterization of the quiescence or eruption status of an active volcano. The volcanic parameters products characterize the quiescence or eruption status of an active volcano by means of volcanic gas emission retrieval (Water vapour and Carbon dioxide columnar content) and temperature of the active lava flow. - Material Detection product defines for each image pixel the similarity measure of the corresponding spectral pixel with respect to the target spectrum. - Urban Map product provides map of urban areas with higher detail on artificial coverages. With PRISMA being fully operational since May 2021, the above product prototypes represent an innovative suite of algorithms that pave the way for routine and operational use of PRISMA data by a large user community, in order to support a wider array of applications.