EARTH OBSERVATION SYMPOSIUM (B1)
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COMPACT HYPERSPECTRAL IMAGERS FOR CANADIAN LAND AND OCEAN MONITORING

Abstract

The Canadian Space Agency (CSA) has reviewed the requirements of Canadian government departments that are not covered by existing or planned space missions. After consolidation of the priorities with the users, one of the most interesting options for future investigation is a hyperspectral imager optimized for large coverage that could be flown on a small-satellite platform. A constellation of three such satellites would provide large scale monitoring of Canadian landmasses, coastal and ocean areas with a 4-day revisit period. The requirements of spectral bandwidth in the visible (VIS) and near infrared (NIR) regions are 10 nm. The requirements in the Short-wave Infrared (SWIR) region cover only a few broad bands that are less demanding and can be met with a multispectral imager. The requirements in the Thermal Infrared (TIR) region are for an instrument similar to the New Infrared Sensor Technology (NIRST), which is a small instrument that would fly on the same platform. Because the mission will be dedicated to a few well-known products, the requirements on the instruments have been relaxed compared to the instruments onboard ENMAP or the previous Canadian HERO mission. The current baseline system would have a ground sample distance of 30 m (in VIS/NIR region), a swath of about 250 km and a SNR of 200:1. Extensive simulations of hyperspectral imagery have been conducted to validate the accuracy of the products with the envisaged system.

Initial optical design exploiting newly proposed techniques for the imaging spectrometer indicated that the payload could be compatible with a small platform like the SSTL-150. To confirm this potential, two feasibility studies have been conducted by the Canadian industry to investigate a Dyson-based and a Linear Variable Filter (LVF)-based imaging spectrometer. A LVF-based imaging spectrometer can yield a much more compact design but suffers from limitations especially in the out-of-band energy. The compact Dyson design offers better image quality but is more complex. This paper will present the overall requirements, system design analysis for the constellation, main budgets, payload design comparisons, main conclusions of the payload feasibility studies and CSA plans for next phases.