

IAF SPACE OPERATIONS SYMPOSIUM (B6)
New Space Operations Concepts and Advanced Systems (2)

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NOVEL OPERATIONAL SCENARIOS FOR THE NEXT-GENERATION EARTH OBSERVATION
SATELLITES SUPPORTING ON-BOARD PROCESSING FOR RAPID CIVIL ALERTS

Abstract

The growing number of planned Earth Observation (EO) satellites, together with the increase in payload resolution and swath, brings to the fore the generation of unprecedented volumes of data that need to be downloaded, processed and distributed with low latency. This creates a severe bottleneck problem, which overloads operations and ground infrastructure, communications to ground, and hampers the provision of EO products to the End User with the required performances. The EO-ALERT project (<http://eo-alert-h2020.eu/>), an H2020 European Union research activity, proposes the definition of next-generation EO missions by developing an on-board high speed EO data processing chain, based on a novel flight segment architecture that moves optimised key EO data processing elements from the ground segment to on-board the satellite. The objective is to deliver the EO products to the end user with latency below 5 minutes, globally. This paper presents the definition of the user requirements for the EO-ALERT EO data processing chain, based on the identified market needs and application scenarios. Considering the innovative on-board processing chains implemented in the EO-ALERT project, the end users consider that the corresponding technology advances can enable very competitive and effective applications in the latency of sensitive scenarios, such as maritime surveillance and in particular disaster management, especially to cope with extreme weather events and the expected needs to detect, monitor and mitigate the effects of climate change. These application scenarios require a high responsiveness to events, reducing the response time to a few hours, or even to minutes, after an emergency situation arises. The European

EO missions that have been selected to develop and test the on-board data processing chain and the new operations concepts are: TerraSAR-X satellite mission embarking an X-band Synthetic Aperture Radar instrument; the Very High Resolution optical satellite Deimos-2, for the ship detection scenario; the SEVIRI sensor on board Meteosat Second Generation, for the meteorological scenario. A high-level mission analysis and concept of operations for the identified scenarios is presented, encompassing: coverage analysis, ground station contact analysis, communications architecture and data latency. An experimental campaign to be performed in July 2020 is intended to validate the technology performances in the experiment scenarios collecting the necessary in-situ data at the same time that remote sensing images are acquired by the selected assets on the region of interest, so as to provide a holistic knowledge of the monitored area and data for validation of the processing chain performances.