Paper ID: 39862
oral

SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (2)

Author: Dr. Stefan Kraft
ESOC - European Space Agency, Germany

Mr. Juha-Pekka Luntama
ESOC - European Space Agency, Germany

ESA'S ENHANCED SPACE WEATHER MONITORING SYSTEM – A NOVEL SYSTEM OF SYSTEMS ARCHITECTURE

Abstract

Space weather monitoring involves a variety of observations to determine the actual state of the Sun, the heliosphere, the Earth environment and the combined space where interactions take place. The Space Situational Awareness Office of ESA has initiated as part of its Programme a number of preparatory studies with the aim to establish a suitable architecture for such an Enhanced Observational Space Weather System. This monitoring system has the ultimate aim of providing data for services that are requested by the space weather user community. As a result it was found that enabling all identified services demands a comprehensive set of measurements from ground, from airborne systems and in particular from space. ESA has based on these studies started to develop a system that is expected to enable in future a majority of the identified and needed services. The observational system utilises three major elements, which shall form the basis of its architecture. The elements include (1) Observations from ground, (2) Observations by a Distributed Space Weather Sensor System (D3S) to monitor the near-Earth environment, and (3) Observational satellites to be positioned in the Lagrangian points L1 and L5. Observations from ground will mostly make use of existing assets of member states and other international partners. D3S shall make use of hosted payloads and instruments, which are currently under development by ESA. The system can potentially be enhanced by a SmallSat system that complements measurements, which are otherwise difficult to implement by hosted payload missions. Satellites in the two Lagrangian points are a key element for providing a holistic view of the Sun-Earth system since they enable the exploitation of observational techniques that come with the utilisation of observations from two distant vantage points. A monitoring system consisting of a set of sensors and satellites located at many different observational points requires a particular infrastructure being able to provide near-real-time acquisition and distribution of data. New specific elements and modern techniques are expected to improve the desired observational capabilities. We will address in this paper the status of the complete architecture with a particular view to the system aspects related to an efficient development, deployment and future operation. This will include the aspect of utilising international collaborations and synergies with the objective to enhance the performance and capabilities of such monitoring system.