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AURORA: A SMALL SATELLITE CONSTELLATION FOR AURORAL OVAL MONITORING

Abstract

As part of the Space Safety Programme, ESA's Space Weather Office is preparing a small satellite mission that shall complement its future enhanced space weather monitoring system. The implementation of the small satellites constellation is expected to become an essential element of ESA's Distributed Space Weather Sensors System (D3S), which has the purpose of monitoring interaction of the Earth with the Sun and to assess and measure the actual conditions in the proximity of the Earth. Monitoring of the Aurora is an essential and central now- and fore-casting element since it enables indirectly the observation of the Solar Wind variations and the impact of Coronal Mass Ejections, which may cause geo-magnetic storms and sub-storms when hitting the Earth. Auroral emissions (optical, far-UV and X-ray) are a direct manifestation of physical processes occurring when the magnetosphere responds to the solar wind and CMEs plasma streams that strongly alter the interplanetary and geomagnetic field. Aurora shall constantly monitor the Auroral oval and the location of on-going geo-magnetic storms and sub-storms and provide information to the locally affected users. The constant (24/7) monitoring of the Aurora requires observations carried out by a number of small 150 kg class satellites to provide sufficient coverage of the complete Auroral oval with good spatial resolution and fast transmission of the data. First analyses in previous studies have identified suitable satellite constellation configurations that may be considered to fulfil the objectives. Further optimisation of this observing system is on-going. Low resource Auroral imaging instruments currently under development will allow multi-spectral imaging, thereby enhancing the reconstruction of the involved processes and the location of their origin. Additionally, as a goal, a magnetometer, plasma analyser and/or neutral atom particle spectrometer are considered to be implemented in form of a small in-situ instruments suite characterising the satellite environment. The small satellite constellation will make progressively use of innovative and highly miniaturised space weather instrumentation, and be based on a robust, reliable, agile and versatile small satellite platform likely with obit rising capability. In order to improve the data latency the use of an inter-satellite or in-space communication link is considered. We will present the current status of the mission study and the system architecture that is required for its implementation, and we will highlight the prospects and future plans.