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SPACE WEATHER INVESTIGATION FRONTIER (SWIFT) MISSION CONCEPT: CONTINUOUS DISTRIBUTED OBSERVATIONS OF GEO-EFFECTIVE, HELIOSPHERIC STRUCTURES FROM THE VANTAGE POINTS OF SUN-EARTH L1 AND SUB- L1

Abstract

Continuous, in-situ, multi-point observations along the Sun-Earth line at and inside the Lagrange point L1 (sub-L1) will enable a better understanding of the three-dimensional structure and temporal evolution of heliospheric structures that drive terrestrial space weather. The proposed SWIFT (Space Weather Investigation Frontier) mission will use a new solar sail propulsion system developed by NASA to enable a suite of science instruments onboard a smallsat to maintain observations along the Sun-Earth line, sub-L1, for extended periods. Three identically instrumented small spacecraft at L1 will fly in concert with the sailcraft at sub-L1in an optimized tetrahedron constellation, covering distances between 10 to 100's of Earth radii. This viewing geometry will enable scientists to distinguish between local and global processes driving space weather by revealing the spatial characteristics, temporal evolution, and geo-effectiveness of small-to-mesoscale solar wind structures and substructures of macro-scale structures, such as interplanetary coronal mass ejections (ICMEs) and stream interaction regions (SIRs). In addition, real time measurements of earth-bound heliospheric structures will improve our current forecasting lead-times by up to 35 percent. This paper will provide an overview of the proposed SWIFT science and mission concept.