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DEVELOPMENT OF SOLAR SAIL TECHNOLOGY TO ACHIEVE IMPROVEMENTS IN SPACE WEATHER FORECASTING

Abstract

Space weather refers to the variable conditions on the Sun and in space that can influence the performance and reliability of space and ground-based technological systems and endanger life or health. Increasingly, space weather is regarded as a global challenge, as it affects several of today's critical technologies and infrastructure and, therefore, the global economy. In the U.S., the National Oceanic and Atmospheric Administration (NOAA) is responsible for providing operational space weather data and services to its users, both domestically and internationally. NOAA's Office of Space Weather Observations is developing new satellite missions to sustain current operational space weather measurements that are being used by forecasters and advancing capabilities that would lead to improved understanding and forecasting of space weather events. Increasing space weather forecasts/alerts lead time is important because it allows for better preparedness and mitigation strategies to minimize the impact of space weather events on various technological systems and activities. The SW Next program is addressing user needs for increased lead time for geomagnetic storm alerts. These alerts are generated from solar wind measurements taken from current missions, such as NASA ACE and NOAA DSCOVR, stationed on the Sun-Earth line at the first Lagrange (L1) Point at 0.99AU. Satellites located upstream of L1 will enable increased forecast lead times. NOAA is investigating solar sail as an enabling technology that will move future satellites closer to the Sun (upstream of the earth-directed solar wind). Operating satellites upstream of the L1 point improve the lead time of geomagnetic storm alerts, which have been unchanged for 45 years. Improvements in forecast lead time are SWO's highest priority for new technology. In this presentation, we will describe the progress of our effort to complete the fabrication of a solar sail with a characteristic acceleration sufficient to hold an Artificial Lagrange Orbit (ALO) of approximately 0.985AU, which would allow a 50% improvement in lead time over current geomagnetic storm alerts.