

SORCE's Flexible Satellite Architecture Allows Science to Continue Despite Hardware Challenges

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The SORCE satellite, with a planned 5-year mission, is currently in its 16th year of operation. Several critical events during the mission have resulted in unexpected changes in order to continue successful science operations.

The first of these occurred during instrument commissioning phase, only one week after launch. Housekeeping data and the ability to consistently command the instruments was lost. Initially a brute force method was deployed, and eventually flight software upgrades were made to enhance science operations and data collection.

A degrading battery in 2013 caused the Flight Operations Team extensively redesigning the way the spacecraft was flown. As the capacity of the battery decreased over time, instruments were phased out of operations in eclipse while strategies were tested to improve battery performance and longevity. Flight software changes were developed for the Attitude and Power Electronics (safemode computer) and the On-Board Computer (main spacecraft computer) and Microprocessor Unit (instrument computer).

SORCE now successfully operates in daylight-only mode where the only components powered on in eclipse are the Attitude and Power Electronics computer and the receiver. Despite the decreased power load, most orbits the APE now browns out in eclipse. Cleverly designed automation sequences have allowed the mission to continue with greatly reduced battery capacity.

Re-defined science objectives are being met through the use of updated spacecraft and ground automation, and new planning and scheduling software. Special calibration activities are performed through the use of temporary on-board command sequences that are loaded by the Flight Operations Team. A final set of special calibrations and experiments are scheduled to be performed in December 2019 during the last mini-eclipse prior to spacecraft passivation in February 2020. These activities will complete a very successful SORCE mission.