

The Magnetospheric Multiscale (MMS) Mission Science Data Center: Technologies, Methods, and Experiences

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The Magnetospheric MultiScale (MMS) constellation of four satellites is NASA's Heliophysics Division flagship mission, making in-situ measurements of magnetospheric particles and fields. Science operations for the mission is conducted at the Science Operations Center (SOC) at the Laboratory for Atmospheric and Space Physics, University of Colorado in Boulder, Colorado, USA. The MMS Science Data Center (SDC) is a component of the SOC responsible for the data production, management, dissemination, archiving, and visualization of the data from the suite of 100 instruments onboard the four spacecraft. As of March 2016, MMS science data are openly available to the entire science community via the SDC. This includes hundreds of science parameters, and 50 gigabytes of data per day distributed across thousands of data files. Products are produced using integrated software systems developed and maintained by teams at other institutions using their own institutional software management procedures and made available via a centralized public web site and web services. To accomplish the data management, data processing, and system integration challenges present on this space mission, the MMS SDC incorporates a number of evolutionary techniques and technologies.

This presentation will provide an informatics-oriented view of the MMS SDC, summarizing its technical aspects, novel technologies and data management practices that are employed, experiences with its design and development, and lessons learned.

Also presented is the MMS "Scientist-in-the-Loop" (SITL) system, which is used to leverage human insight and expertise to optimize the data selected for transmission to the ground. This smoothly operating system entails the seamless interoperability of multiple mission facilities and data systems that ultimately translate scientist insight into uplink commands that triggers optimal data downlink to the ground.