

order. All data saved in the system can be straightforwardly retrieved, exported, and migrated.

Using TSDSS's interactive data visualization tool, a user can conveniently choose any combination and mathematical computation of interesting telemetry points from a large range of time periods (life cycle of mission ground data and mission operations testing), and display a graphical and statistical view of the data. With this graphical user inter-

face (GUI), the data queried graphs can be exported and saved in multiple formats. This GUI is especially useful in trending data analysis, debugging anomalies, and advanced data analysis. At the request of the user, mission-specific instrument performance assessment reports can be generated with a simple click of a button on the GUI.

From instrument level to observatory level, the TSDSS has been operating supporting functional and performance

tests and refining system calibration algorithms and coefficients, in sync with the Aquarius/SAC-D spacecraft. At the time of this reporting, it was prepared and set up to perform anomaly investigation for mission operations preceding the Aquarius/SAC-D spacecraft launch on June 10, 2011.

*This work was done by Lakesha Bates and Liang Hong of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16035-1*

## ➤ CropEx Web-Based Agricultural Monitoring and Decision Support

**Changes in crop health are monitored over time.**

*Stennis Space Center, Mississippi*

CropEx is a Web-based agricultural Decision Support System (DSS) that monitors changes in crop health over time. It is designed to be used by a wide range of both public and private organizations, including individual producers and regional government offices with a vested interest in tracking vegetation health. The database and data management system automatically retrieve and ingest data for the area of interest. Another stores results of the processing and supports the DSS. The processing engine will allow server-side analysis of imagery with support for image sub-setting and a set of core raster operations for image classification, creation of vegetation indices, and change detection.

The system includes the Web-based (CropEx) interface, data ingestion system, server-side processing engine, and a database processing engine. It contains a Web-based interface that has multi-tiered security profiles for multiple users. The interface provides the

ability to identify areas of interest to specific users, user profiles, and methods of processing and data types for selected or created areas of interest. A compilation of programs is used to ingest available data into the system, classify that data, profile that data for quality, and make data available for the processing engine immediately upon the data's availability to the system (near real time).

The processing engine consists of methods and algorithms used to process the data in a real-time fashion without copying, storing, or moving the raw data. The engine makes results available to the database processing engine for storage and further manipulation. The database processing engine ingests data from the image processing engine, distills those results into numerical indices, and stores each index for an area of interest. This process happens each time new data is ingested and processed for the area of interest, and upon subsequent database entries, the database processing engine

qualifies each value for each area of interest and conducts a logical processing of results indicating when and where thresholds are exceeded. Reports are provided at regular, operator-determined intervals that include variances from thresholds and links to view raw data for verification, if necessary.

The technology and method of development allow the code base to easily be modified for varied use in the real-time and near-real-time processing environments. In addition, the final product will be demonstrated as a means for rapid draft assessment of imagery.

*This work was done by Craig Harvey and Joel Lawhead of Stennis Space Center.*

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## ➤ High-Performance Data Analysis Tools for Sun-Earth Connection Missions

**Applications include medical image analysis, hyperspectral imaging, wildlife tracking, and sensor data processing.**

*Goddard Space Flight Center, Greenbelt, Maryland*

The data analysis tool of choice for many Sun-Earth Connection missions is the Interactive Data Language (IDL) by ITT VIS. The increasing amount of data produced by these missions and the increasing complexity of image process-

ing algorithms requires access to higher computing power. Parallel computing is a cost-effective way to increase the speed of computation, but algorithms oftentimes have to be modified to take advantage of parallel systems. Enhancing IDL

to work on clusters gives scientists access to increased performance in a familiar programming environment. The goal of this project was to enable IDL applications to benefit from both computing clusters as well as graphics processing