Software Tools for Space Weather Research, Forecasting, and Anomaly Analysis

C.P. Wiegand, M. Maddox, M. L. Mays, R. Mullinix, A. Pulkinnen, Y. Zheng, M. Kuznetsova
CCMC/SWRC, NASA Goddard Space Flight Center

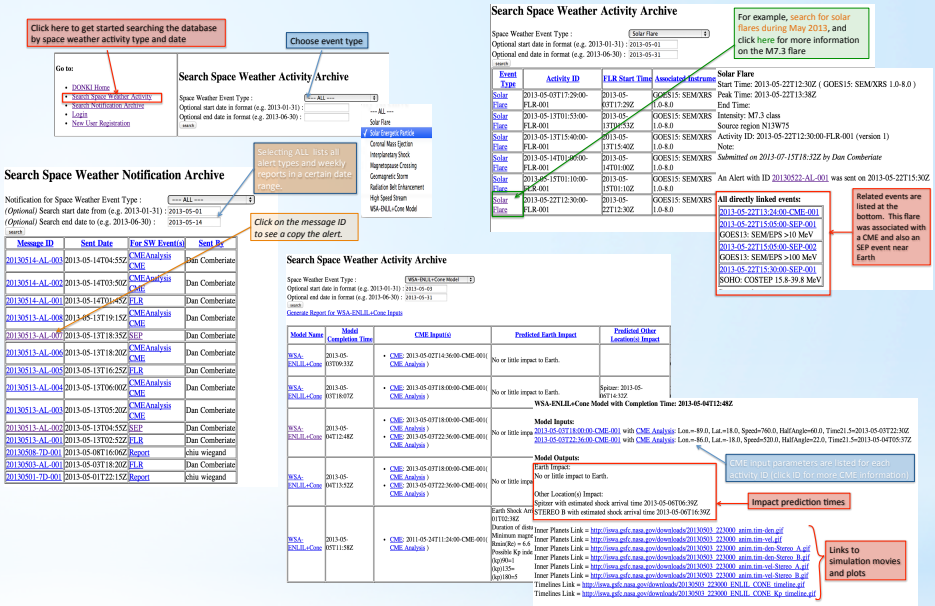
DONKI: Space Weather Database of Notifications, Knowledge, Information

Abstract:

Before the Space Weather Database of Notifications, Knowledge, Information (SW DONKI), there was no centralized database or application that allowed space weather researchers/forecasters working with the CCMC/SWRC at NASA GSFC to record observed space weather activities. SW DONKI is being developed as an online tool for both space weather forecasters and researchers, enabling remote participation by students, world-wide partners, model developers, and forecasting technique developers. The system will serve as an archive of all space weather activities including: flares, CMEs, SEPs, and geomagnetic storms. An innovative feature of the system is the ability to generate, modify, and store complex linkages between activities - creating a comprehensive network of relationships between activities, and identifying potential cause-and-effect paradigms. The system will archive all human generated event analysis and other notifications produced by the SWRC team. In support of NASA missions, the SW DONKI will also send out both automated and human generated notifications to help operators identify and/or minimize any potential negative impact of a particular space weather event on NASA assets. These notifications will also help facilitate special observational campaigns, allowing some missions to actively target expected events.

Features/Benefits:

- Chronicles the daily interpretations of space weather observations, analysis, model results, forecasts, and notifications provided by the Space Weather Research Center
- Comprehensive knowledge-base search functionality to support anomaly resolution and space weather research
- Intelligent linkages, relationships, cause-and-effects between space weather events
- Automatic dissemination of forecasts and notifications
- One-stop on-line tool for space weather forecasters and researchers
- Enable remote participation by students, world-wide partners, model and forecasting technique developers



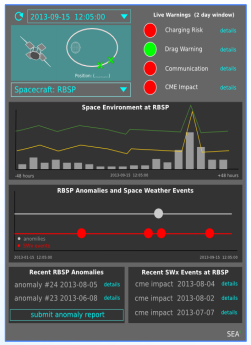
The Space Environment Automated Alerts Anomaly Analysis Assistant (SEA5)

Abstract:

The Space Environment Automated Alerts & Anomaly Analysis Assistant (SEA5) system being developed at CCMC/SWRC is a comprehensive space weather information analysis and dissemination system that will provide past, present, and predicted space environment information for specific missions, orbits, and user-specified locations throughout the heliosphere and geospace. The main objective of the tool is to provide an unprecedented capability for viewing space environment conditions for specific missions/orbits by: (1) providing automated space weather notifications for specific missions/orbits, (2) assimilating and displaying spacecraft anomaly information, and (3) managing and displaying spacecraft/mission data.

SEA5 Mockup User Interface:

The highly tailored SEA5 interface will display information specific to the currently selected spacecraft. In this example, the Van Allen Probes/RBSP mission is selected and all information displayed is unique to that specific mission. The web-based user interface will display orbit information, orbit and spacecraft specific space weather notifications, general space environment information, and a list of both space weather events and spacecraft anomalies. The interactive interface will also allow users to add/submit new anomaly reports that are subsequently aggregated and stored within the system.



SEA5 Framework Architectural Design Overview:

The SEA5 Framework will utilize numerical space weather model output provided by the Community Coordinated Modeling Center (CCMC) as well as real-time and near-real time space weather data streams provided by the Integrated Space Weather Analysis System (iSWA). A comprehensive data model will be developed and implemented enabling the system to provide space environment information for any arbitrary location throughout the heliosphere. Highly tailored displays, notifications, and anomaly reports will be presented to end users for a specific spacecraft and/or orbit. An interactive feedback mechanism will be developed to allow user input into the system for custom spacecraft anomaly reporting.