The SolarSoft experience, and its application to STEREO

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What is SolarSoft?

• SolarSoft is a collection of software used for a wide variety of Solar Physics missions.
• Gives users and software developers a common environment for data analysis.
• Encourages data sharing, by allowing scientists to combine data from multiple sources in a single common environment.
• Provides an easy-to-use distribution system for software, and associated ancillary data files (e.g. calibration).
  – Users can keep their copy of SolarSoft up-to-date through nightly mirrors of changes.

http://www.lmsal.com/solarsoft/
Supported Missions and Observatories

Space Missions

- **CGRO/BATSE**: Compton Gamma Ray Observatory / Burst and Transient Source Experiment
- **GOES**
  - X-ray Flux Monitor
  - **SXI**: Solar X-ray Imager
- **HXRS**: Hard X-Ray Spectrometer
- **RHESSI**: Ramaty High Energy Solar Spectroscopic Imager
- **SMEI**: Solar Mass Ejection Imager
- **SMM**: Solar Maximum Mission
- **SOHO**: Solar and Heliospheric Observatory
- **Solar-B**
- **Spartan 201**
- **STEREO**: Solar Terrestrial Relations Observatory
- **TRACE**: Transition Region and Coronal Explorer
- **Yohkoh**

Optical

- **Mees Solar Observatory**, Haleakala, HI
- **NSO**: National Solar Observatory
- **SOON**: Solar Observing Optical Network
- **Swedish Solar Telescope**, La Palma, Spain

Radio

- **ETH Zurich**
- **NRH**: Nançay Radio Heliograph
- **NRO**: Nobeyama Radio Observatory
  - Radioheliograph
  - Radio Polarimeters
- **OVSA**: Owens Valley Solar Array
SolarSoft Example: Latest Events

• Automatically updated page shows latest solar events.

• Shows power of SolarSoft library.

• Planning on using a version of this for displaying recent STEREO data on the web.

http://www.lmsal.com/solarsoft/latest_events/
SolarSoft Layout

• SolarSoft has a number of subdirectories, which split into three main categories:
  – General software ("gen"), shared by all
  – Mission-specific trees
    • Usually have instrument-specific trees under each mission top directory
    • Can also have mission “gen” tree, for software shared between the instruments
  – Optional packages (e.g. CHIANTI)

• Users can select which instruments should be loaded into IDL at run-time.
  – Start-up configuration done automatically
The SolarSoft tree for STEREO has already been started.

All the instrument teams have committed to distributing their software through SolarSoft.

Some software has been uploaded to the SECCHI and SSC software trees.

Software has also been loaded in the STEREO “gen” tree, mainly for telemetry, and orbit and attitude files.
SolarSoft experience

- The big advantage of SolarSoft is that there is a vast amount of software already written to solve many common problems
  - The downside is that it can sometimes be difficult to find that software
- Software written for SOHO has been reused for STEREO
  - E.g. time-handling software
- SolarSoft is best described as a “beta-test” system, where problems are found by the user community, and solved by the core teams.
  - No official releases, continuously being updated
  - Most bug fixes done very quickly
SOHO/CDS use of SolarSoft

• The Coronal Diagnostic Spectrometer aboard SOHO has taken a “snapshot” approach towards SolarSoft:
  – Analysis is done with the standard SolarSoft tree. Problems appear here first.
  – A separate copy of SolarSoft is used for operations.
    • The operations copy is refreshed only at designated times
    • A time-stamped (gzipped) tar file is made of the tree before refreshing. If any problems are found, the previous version of the operations tree can be recovered.
    • The operations tree also contains directories not found in SolarSoft

• Thus, the analysis and operations trees do not diverge from each other, but the operations tree is fully controlled.
Software Notes

• One of the concepts that CDS made use of was “software notes”.
  – A collection of numbered documents describing various aspects of the software
  – Served on the web
  – One of the software notes is a user’s guide
    • Most of the other notes were written first

• Created a directory to hold STEREO-wide software notes within SolarSoft:
  $SSW/stereo/gen/documentation

• Suggest that instruments include their own documentation subdirectories within the SolarSoft tree
A useful concept is to have resource pages for each instrument.

Similar format for each instrument.

Provides information about file formats, calibration, analysis software, and contact information.

We ask that each STEREO team provide and maintain such a page.

See the SOHO pages at the URL below for examples.

http://soho.nascom.nasa.gov/mission/instruments.html
New Stuff

• Software using network sockets to read data files from the web

• Hooks into VSO using Java/IDL bridge

• Object-oriented software

How Solar-B, the VSO, & IDL work together