

Enhancements to the Virtual Solar Observatory



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Virtual Solar Observatory
<http://www.virtualsolar.org/>

Abstract:

Numerous changes have been made to the Virtual Solar Observatory (VSO) since its first public release. We will present work on the VSO architecture to allow for customized user interfaces for specific user groups or data repositories, a more powerful and flexible Registry matching engine, support for standards-based metadata encapsulation using XML VOTable standards, improved catalog searches, a simplified and more powerful API for Data Providers, and other new and upcoming functionality to improve VSO search capabilities.

New Search Parameters:

There have been requests for easier ways to search for and filter data products while providing the flexibility necessary to support additional mechanisms in the future. The Virtual Solar Observatory will pass through any parameters given it, allowing Data Providers to add hooks for customized User Interfaces.

In an effort to standardize the new terms, the following parameters have been added by one or more Data Providers:

- detector :** Detector (or other sub-instrument) name
- filter :** Filter Name (may be detector or instrument specific; values are not standardized by VSO)
- level :** Processing Level (levels need to be standardized for effective searching)
- datatype :** Layout of the Data (eg, image, map, spectral_temporal)
- extent type :** General Observed Region (eg, limb, corona, fulldisk) now includes far_off_sun for non-sun observing instruments, such as SECCHI-H11.
- polarization :** The polarization angle of the observation, or unpolarized data
- wave type:** The class of spectral data (eg, narrow, broad, line)

The following additions are planned, but are not yet finalized and implemented:

- Plate Scale**
- Cadence**
- Number of data points**
- Modified Date**
- Observed Extent (specific coordinates)**
- Quicklook (flag for non-science quality data)**

Shopping Cart API:

The Shopping Cart metaphor used by the VSO Web UI provides an easy way for scientists to record data of interest for later downloading. There has been interest in making it available to other clients, so that scientists can mark observations of interest, and then easily share them with colleagues.

There has also been interest in using the Shopping Cart IDs in publications, so that journal articles can cite the data that were used, and the missions can show what research is using their data. The VSO is working with the library and scientific communities in such efforts.

IDL Client:

A VSO client is now available in IDL. The code is pure IDL, and all required libraries are available through SolarSoft.

```

SSC - 77x8 - 89
IDL> a = vso_search( '2006-02-02', '2006-02-03', inst='lasco' );
Records Returned : SDAC : 117/117
IDL> b = vso_get( a[where (a.info eq 'JOP 78')], /quiet )
IDL>
IDL> a = vso_search( '2006-01-01', inst='sxi-0' )
Records Returned : NGDC : 1000/1439
IDL> b = vso_get( a[where (stregex(a.info, 'P_MED_B', /bool))], /quiet )
IDL>

```

Current Status:

There have been some performance issues identified with larger return structures, and the way in which we are processing the XML structure. The current version is usable up to about 1000 records.

The IDL client currently only supports synchronous file transfers. It can find products of interests, but may not be able to acquire data from providers who require the files to be staged before download.

VOTable Support:

To support collaboration efforts with other upcoming virtual observatories, and to make it easier for UI programmers to deal with the changing VSO parameters, VSO has been moving towards using VOTable to package its metadata. This should significantly reduce message size, and allow the search results to be used as an ad-hoc catalog.

Current Status:

Preliminary support is completed; modifications need to be merged into the improved Data Provider inheritable, and a translation service created to allow backwards compatability.

Centralized Registry:

Although it would be preferable to maintain the VSO as a scale-free network, there is currently no mechanism for a VSO instance to discover new Data Providers, or modifications to archives.

We plan to have mirrored centralized locations where instances can check for changes and automate updates. This will reduce the effort necessary to coordinate changes between VSO instances, and reduce the burden on others who may wish to run their own VSO instances.

Improved Data Provider Toolkit:

The increased number of search parameters increases the complexity for new Data Providers to enter the VSO. A new Data Provider Toolkit has been created that significantly reduces the amount of coding required to implement a web service to access data.

To keep the size of the records returned to a reasonable size, we are also introducing a mechanism for User Interfaces to request a specific set of fields to be returned, which may be more or less than those typically returned, as well as ways to request aggregated (summary) information, rather than details of each individual observation.

Current Status:

A SQL version has been implemented, and we have plans to implement a version that walks a local directory structure or remote FTP site. The summary interface was separately prototyped, and the two need to be integrated.

Catalogs as Services:

The ever increasing data rates of instruments preclude scientists from inspecting every image taken. Scientists are increasingly using event catalogs to identify regions or periods of interest; some wish to merge multiple catalogs to further refine their queries.

As some catalogs still actively growing, we have decided that it may be best to treat these catalogs as solar physics data themselves, and attempt to query the most recent copies, rather than trying to parse and update them on an infrequent basis.

As with the work already done by the VSO to allow other programmers to access scientific observations in a homogeneous way, we wish to create an API to allow tool and UI developers to search solar and other event catalogs with the same ease.

Current Status:

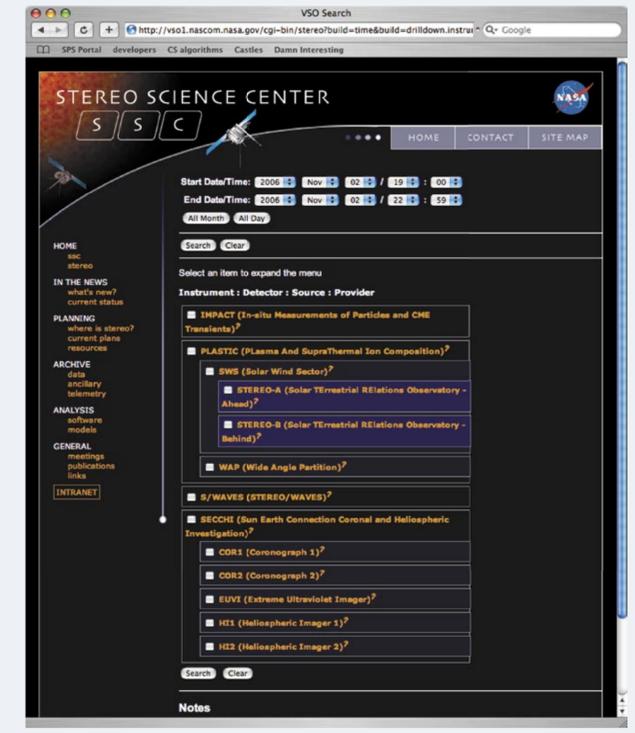
We are looking into how best to abstract the values from a catalog in a meaningful way, and to determine a query syntax that supports the complexity necessary without being a burden to implement. Please contact us if you are interested in working together on this effort.

Customizable Web UI:

There has been interest from archives in being able to customize the Web User Interface so that they can add search parameters that are useful to their data, without needing to maintain a completely customized interface.

Current Status:

The VSO form interface has been re-written using a templating system, to allow easier addition of search parameters. In addition, the user interface may pass filters to the VSO to restrict the search and the population of the menus generated. The headers and footers of the page may be replaced, and the overall look and feel modified with CSS.



Registry API:

With the increase in new clients to VSO, we now have a mechanism to request details about what data sets are available through the VSO. This should allow User Interface designers to poll the VSO to populate their menus and other lists.

This will also allow an automated way of getting the full name or description for a parameter value from an abbreviation.

Current Status:

A prototype exists, but the implementation has shown to be difficult to call via IDL. There are plans to re-implement the API using VOTable for data packaging.

SPASE Support:

VSO is committed to community interoperability efforts, such as the Space Physics Archive Search and Extract (SPASE).

The VSO is planning on publishing information about the holdings searchable through VSO in SPASE format, so that they are discoverable from other Virtual Observatories.

More information about SPASE is available from:
<http://www.spase-group.org/>

Future Plans:

The Virtual Solar Observatory will continue to add new features and data sets as requested by the community. Other proposed features include:

- Sideways Searching**
Using a search result to find additional similar records
- Quick Search Interface**
Allowing a user to search for data using a single text field input, without the complexity of the current web-based interface
- Drilldown Interface**
Restricting the number of options shown, based on the values already selected. (eg, if you select a given spectral range, to only show physical observables available for that spectral range)
- Ranked Results**
Allowing the results to be sorted by some measure of quality. (eg, the best spatial or temporal resolution, or the closest match to a requested spectral range or spatial area)
- Recommendations**
The ability for the User Interface to suggest alternatives to searches, such as other instruments that observe with similar parameters.
- Cadence Searching**
Requesting one observation for each fixed period over a given duration.
- VOQL & ADQL Support**
Support for the Virtual Observatory Query Language and Astronomical Data Query Language.

If there are features that you wish to see implemented, or collaborate on, please let us know.