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Improvements to the Virtual Solar Observatory

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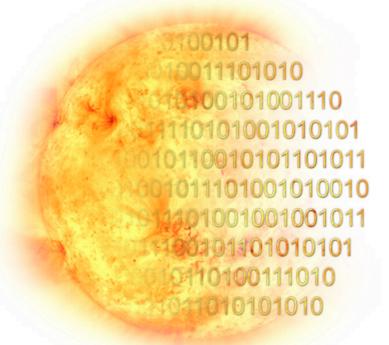
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Virtual Solar Observatory
http://virtualsolar.org/

We present the updated web-based user interface to the Virtual Solar Observatory (VSO), and the current state of user interfaces to VSO.

We look forward to feedback from the solar and heliospheric physics community on the current and planned functionality to help us set our priorities for the coming year.

Access from Python

The VSO has a robust API that allows creation of clients in multiple programming languages. The SunPy team received funding from the ESA Summer of Code in Space to support a summer intern, who added querying and retrieval of data using the VSO API.

SunPy has two clients to search the VSO:

VSOClient :
> for automated queries; can be subclassed and methods overriden:

InteractiveVSOClient :
> for interactive queries; will prompt for input as needed.

The interactive client has a `query_legacy` function that replicates the IDL `vso_search` command, to allow existing IDL users to get up to speed quickly. You can also use the `search` function, which will route between the `query` and `query_legacy` functions as appropriate.

Special Features:

Hierarchical directory building by giving a path template, eg:
```
client = sunpy.net.vso.InteractiveVSOClient
queryResponse = client.search( ... )
client.get( queryResponse,
    path='/tmp/{source}/{instrument}/{file}' )
```
Asycnronous (background) retrieval of files. You can append '.wait()' to the retrieval call to have the procedure only return after the downloads have completed:
```
client.get( queryResponse ).wait()
```
Boolean 'or' support to specify more than one of a given parameter via the pipe (|) character:
```
queryResponse = client.search(
    vso.attrs.Time((2011,1,1),(2011,1,2)),
    vso.attrs.Instrument('euvi')
    | vso.attrs.Instrument('aia'),
    vso.attrs.Wave(171,171) )
```

For more information or to download SunPy, visit their website:
> **http://www.sunpy.org/**

STATUS : Complete, available from the SunPy website

SDO Caching Nodes

SDAC and UCLan are now operating as caching nodes for AIA and HMI data, along with NSO, SAO and ROB

If using IDL, instead of using the '`site`' keyword with `vso_get`, you can now set the environmental variable:
```
VSO_DEFAULT_SITE
```
**STATUS :** Complete, in SolarSoft

Web User Interface Rewrite

We now have a special exemption from NASA to be allowed to use cookies to save user preferences, but some other rules changes have delayed the full deployment of the new interface.

We announced the testing of the new interface in SolarNews, but the server used for testing went down shortly afterwards, so we'd still be interested in feedback:
> **http://beta.virtualsolar.org/**

STATUS : Available for testing; requires backend changes before moving into production
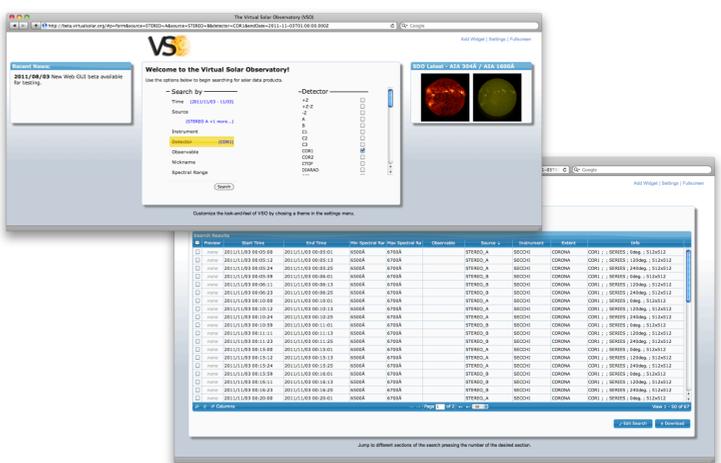
Web User Interface Incremental Improvements

In light of the delays of the full re-write, we have started to add some of the attributes and features in the IDL client to the current web user interface, including:

More metadata to filter on:

> detector : C1/C2/C3 for LASCO, EUVI/COR1/COR2/HI1/Hi2 for SECCHI
> data layout : image, time_series, spectrum, map, etc.
> info : a free text field set by the data providers

More metadata to search on (data layout)

Additional time searches ('near' and 'sample')

STATUS : In testing now, may be partially available by AGU

Staging for SDO/AIA & HMI Data

Support for 'staging' of tarballs of data from AIA (Atmospheric Imaging Assembly) and HMI (Helioseismic and Magnetic Imager), rather than the streaming of tarballs . For users with unreliable connections, this means that the download can continue from when it was interrupted, rather than restarting from the beginning.

There have also been a number of updates of the software behind the scenes to improve the speed and reliability of the distribution and caching of AIA and HMI data.

STATUS : Almost done; may be available by AGU

SDO/EVE Data Access

After much too long of a delay, we have fully tested EVE (Extreme Ultraviolet Variability Experiment) irradiance data, but we needed updates to the VSO web user interface to fully support them.

STATUS : In testing; should be available by AGU

Lower Latency AIA NRT Data

The AIA Synoptic Near Real Time data is using an alternate pipeline that does not rely on large batch processing. This means that we can typically serve the AIA NRT (1024x1024, 3 min. cadence) images about 10 to 15 minutes after they are taken.

It can be selected in the IDL interface by specifying '`pix=1024`', or via the web interface by selecting AIA under the 'SDAC' provider.

The VSO will only show the NRT data for the last 7 days, so when searching for earlier times, you will only get one data set: the fully calibrated data, full resolution (4096x4096), full cadence (12sec for EUV), level 1 data.

STATUS : Complete

VSO Help within IDL

As the VSO uses a series of wrappers around a main object, and the use of 'extra' to pass values, many IDL commands to tell you what the appropriate variables are don't return anything useful. Therefore, we have a command 'vso_help' that gives information about the VSO IDL commands:

```
IDL> vso_help
IDL> vso_help, /search  ; docs for the vso_search command
IDL> vso_help, /get     ; docs for the vso_get command
IDL> vso_help, /info    ; docs for the vso_info command
```

In addition, the `vso_*` commands now support a '`/help`' parameter:

```
IDL> a = vso_search( /help )
IDL> a = vso_get( /help )
IDL> vso_info, /help
```

STATUS : Done; will be in SolarSoft by AGU

VSO Registry Search in IDL

As new series are made available through VSO, users need to be able to easily find what datasets and options are available.

```
IDL> vso_info, /help
```
Print a listing the instruments available through VSO:
```
IDL> vso_info, /instruments
```
Print a listing of instruments and their associated observatory:
```
IDL> vso_info, /instrument, /sources
```
Return an array of records (anonymous structures) of physical observables, without printing to the screen
```
IDL> vso_info, output=output, /physobs, /quiet
```

STATUS : Done; will be in SolarSoft by AGU

Current VSO Priorities

Due to the efforts that have gone into getting AIA & HMI data available through the VSO in a reliable manner, other efforts have been delayed for the last couple of years, but we will be focusing our attention in the new year on:

New Data Providers
> CLIMSO, PROBA-II, DOT, PSPT, SOXS, SORCE, Koronas, ISOON, DLSP, YNST, SMART, Wendelstein, etc.

Updates to Existing Data Providers
> Fixing slow or troubled sevices, adding support for 'sample' , 'near' and other options that have been added since those providers were first written

Shopping Cart API
> A redesign of the VSO Shoping Cart to allow access from IDL and other interfaces.

New features
> Spatial searching, searching by 'class' of instrument (eg, coronagraph, photometer), HEK and improved catalog access, etc.

Mailing Lists

We have created mailing lists to keep people updated on new features and give people a place to discuss proposed changes:

For IDL users:
> **http://groups.google.com/group/vso-idl**

For programmers using the API:
> **http://groups.google.com/group/vso-api**

Support Email Addresses

Have a question or something just doesn't seem right? There's now a single e-mail address, and we'll route your question to the right person:
> **help@virtualsolar.org**

Are there any features that you'd like, or data that you want us to prioritize getting into the VSO?
> **requests@virtualsolar.org**

Acknowledgements