

# The Virtual Solar-Terrestrial Observatory; access to and use of diverse solar and solar-terrestrial data

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# Virtual Observatories

Make data and tools quickly and easily accessible to a wide audience.

Operationally, virtual observatories need to find the right balance of data/model holdings, portals and client software that researchers can use without effort or interference **as if all the materials were available on his/her local computer using the user's preferred language: i.e. *appear to be local and integrated***



# Coupling Energetics and Dynamics of Atmospheric Regions

VSTO Workflow 1a

http://www.vsto.org/data/useCase1a.htm

Google Session Information The OPeNDAP Data Con... Session Information http://www.c...

NCAR Virtual Solar Terrestrial Observatory

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Start by Instrument | Start by Dates | Start by Parameter

Data Workflow #1a

Input Step 1 of 3: Choose Instrument

Please select an instrument

You may filter the instruments selection by one of the following criteria

Filter by Physical Domain:  -OR- filter by Instrument Type:

Show Instrument Code

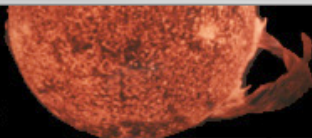
[?] **Instrument:**

- OpticalInstrument > Photometer > Chromospheric Helium Imaging Photom
- OpticalInstrument > Photometer > MK3-K Coronameter [?]
- OpticalInstrument > Photometer > MK4-K Coronameter [?]
- OpticalInstrument > Photometer > H-alpha prominence and solar disk moni
- OpticalInstrument > Photometer > MultiChannelPhotometer > Poker Flat 4
- OpticalInstrument > Photometer > MultiChannelPhotometer > Fort Yukon /
- OpticalInstrument > Spectrometer > SpectroPhotometer > Davis Antarctica

Semantic filtering by domain or instrument hierarchy

Community data for observations and models of Earth's upper atmosphere and geophysical indices and parameters needed to interpret them. Includes Browsing, plotting capabilities by periods, instruments, models, ...





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**Guided Workflows:** [Start by Instrument](#) | [Start by Dates](#) | [Start by Parameter](#)    **Web Services:** [Query Instrument](#) | [Query Parameter](#) | [Query Dates](#) | [Query Data](#)

## VSTO Guided Workflow: Start by Parameter

### Data Request Summary

1. Parameter: [ElectronTemperature](#) [?]

2. Start Date: 2000/03/14  
Stop Date: 2000/03/18

3. Instrument: [Irkutsk Russia I.S. Radar](#) [?]

### Available Output

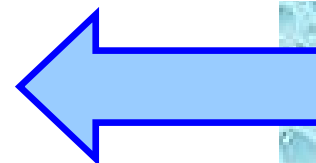
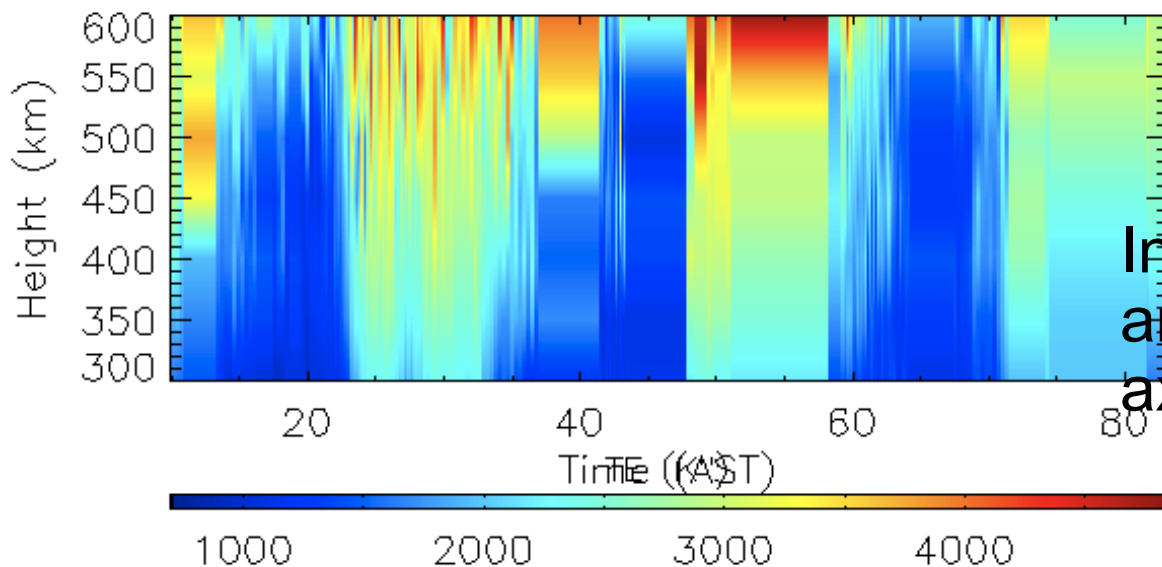
The following data products match the current selection:

**Data Files:** [TAB](#) [?] | [FLAT](#) [?] | [INFO](#) [?] | [DAS](#) [?] | [DDS](#) [?] | [OPeNDAP](#) [?] | [STREAM](#) [?] | [IDL](#) [?]

**Data Plots:** [Height vs Time](#) [?]

### Change Input

Click on the Back button to change your data selection, or Cancel to end the workflow



Inferred plot type and return required axes data



# Content: Mauna Loa Solar Observatory

Near real-time data from Hawaii from a variety of solar instruments.

Source for space weather, solar variability, and basic solar physics

Other content

- CISM - Center for Integrated Space Weather Modeling

File Edit View Go Window Help

Bookmarks Location: [http://mlso.hao.ucar.edu/cgi-bin/mlso\\_homepage.cgi](http://mlso.hao.ucar.edu/cgi-bin/mlso_homepage.cgi)

## Mauna Loa Solar Observatory HAO

Welcome to the Mauna Loa Solar Observatory (MLSO) Website. The MLSO, operated by the High Altitude Observatory in Boulder Colorado, houses several instruments designed to observe the sun at many different wavelengths.

**ACOS** Advanced Coronal Observing System. A suite of instruments designed to observe the solar atmosphere at a variety of heights. Includes Chromospheric Helium Imaging Photometer (CHIP, 1083.0nm), H-alpha prominence and solar disk monitor (PICS, 656.2nm), and the Mk4 K-coronameter, which observes the white light K-corona from 1.12-2.79 solar radii.

**ECHO** Experiment for Coordinated Helioseismic Observations. A network of two instruments which observe solar oscillations as seen in the radial velocity of the solar surface.

**PSPT** Precision Solar Photometric Telescope. Observes the solar disk in three bandpasses: 605-610 nm (red), 408-412 nm (blue), and 393 nm (CaIIK).

[ACOS](#) [ECHO](#) [PSPT](#) [Hawaii Wx](#) [Related Sites](#) [Contact Us](#)  
[Eclipses](#) [Instruments](#) [Publications](#) [About MLSO](#)

### Latest MLSO Images

ACOS Mark-IV	ACOS PICS Limb	ACOS PICS Disc	ACOS CHIP
<b>K-Corona</b> 700-950 nm 27-Nov-2003 20:59 <a href="#">Movie [merged-GIF]</a> PSPT CaIIK	<b>H-Alpha Limb</b> 656.3 nm 28-Nov-2003 21:11 <a href="#">Movie [merged-GIF]</a> PSPT Blue	<b>H-Alpha Disk</b> 656.3 nm 28-Nov-2003 21:04 <a href="#">Movie [merged-GIF]</a> PSPT Red	<b>Helium-I</b> 1083 nm 28-Nov-2003 17:20 <a href="#">Movie [merged-GIF]</a> ECHO Sample Velocity Image

100%

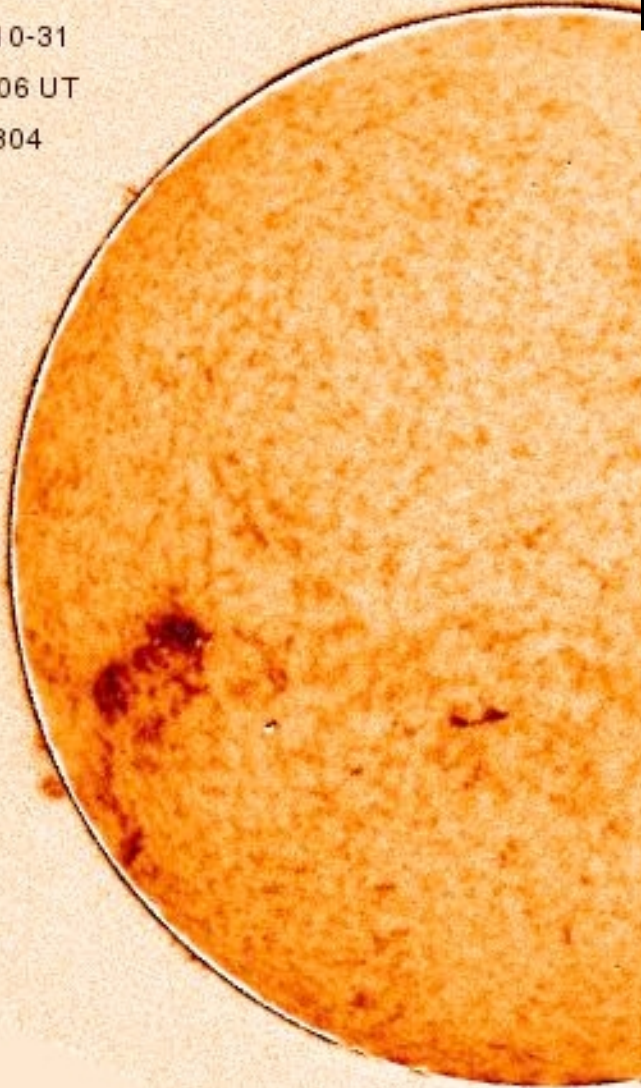
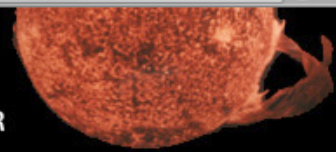


MLSO CHIP  
HELIUM-I  
2006-10-31  
22:46:06 UT  
DOY: 304

N

CAR

# Virtual Solar Terrestrial Observatory



E

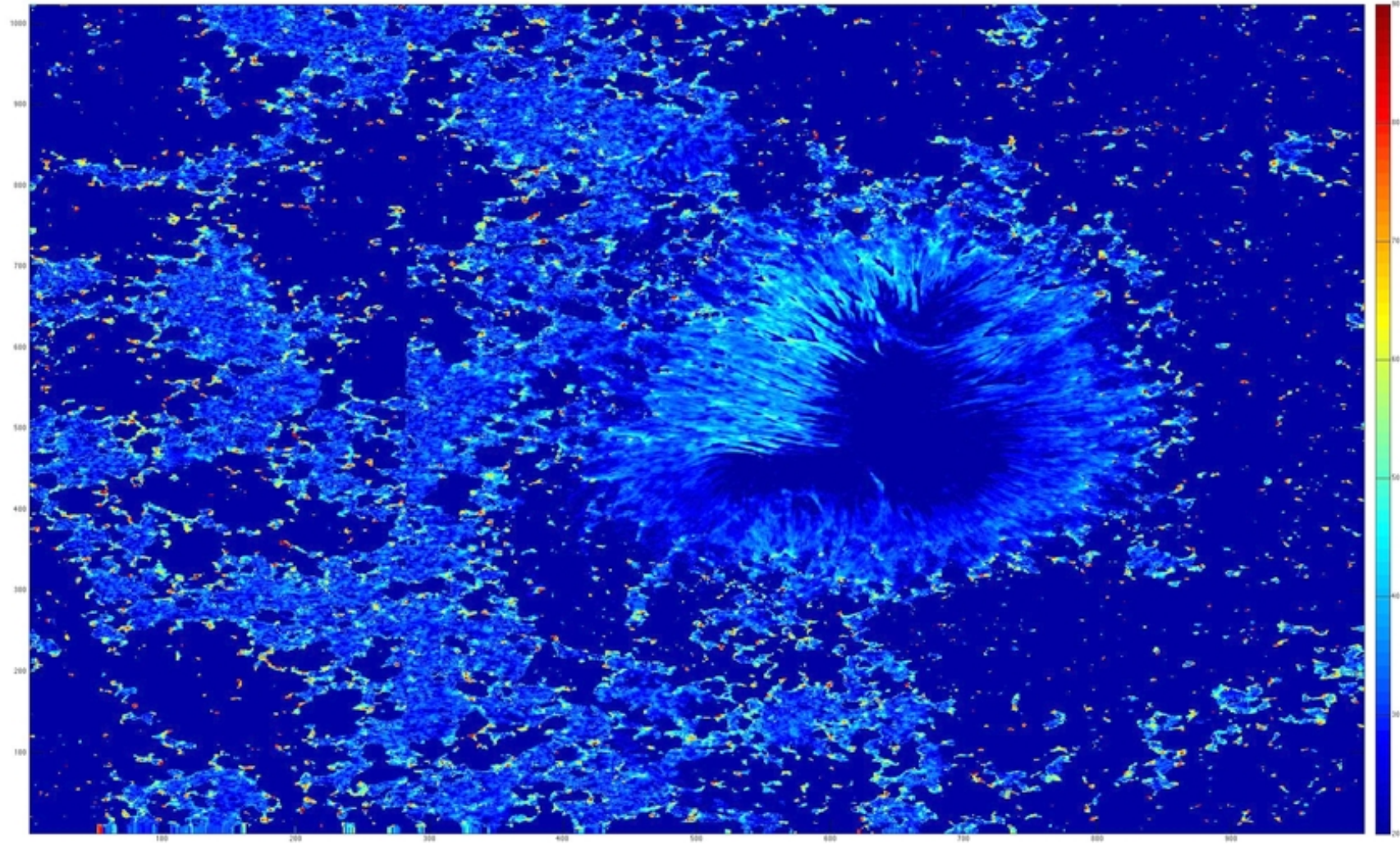
S

Scaling: -1200 to 50

## Data Products

The following data products matched your request:  
(Please note that FITS and OPeNDAP based access will take longer since files are retrieved from tape)

- ▶ 20061029.173302.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.173507.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.173810.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.174110.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.174407.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.174708.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.175006.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.175306.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.175607.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.175906.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.180206.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.180704.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.180907.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.181206.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.181506.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.181807.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.182106.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.182409.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.182710.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.183007.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.183306.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.183607.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.183906.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)
- ▶ 20061029.184206.chp.hsh: [JPG](#) [FTS](#) [DAS](#) [DDS](#) [OPeNDAP](#) [ASC](#) [HTML](#)



# E.g. Science and technical use cases

Find data which represents the state of the neutral atmosphere anywhere above 100km and toward the arctic circle (above 45N) at any time of **high geomagnetic activity**.

- Extract information from the use-case - encode knowledge
- Translate this into a complete query for data - inference and integration of data from instruments, indices and models

Provide semantically-enabled, smart data query services via a SOAP web for the Virtual Ionosphere-Thermosphere-Mesosphere Observatory that retrieve data, filtered by constraints on Instrument, Date-Time, and Parameter in any order and with constraints included in any combination.



Added value

Education, clearinghouses, other services, disciplines, etc.

Semantic mediation layer - mid-upper-level

Semantic interoperability

VO

Web

VO

“Knowledge” as service!

### Mediation Layer

- Ontology - capturing concepts of Parameters, Instruments, Date/Time, Data Product (and associated classes, properties) and Service Classes
- Maps queries to underlying data
- Generates access requests for metadata, data
- Allows queries, reasoning, analysis, new hypothesis generation, testing, explanation, etc.

and use of data

low level

Standard, or not, vocabularies and schema

DB<sub>n</sub>

# Semantic Web Services

VSTO Query Instrument Web Service

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**Guided Workflows:** [Start by Instrument](#) | [Start by Dates](#) | [Start by Parameter](#) | **Web Services:** [Query Instrument](#) | [Query Parameter](#) | [Query Data](#)

## VSTO Web Services

### Query Instrument Web Service

**Description:** Web Service used to query the VSTO ontology to retrieve all the Instrument instances matching one or more optional constraints.

**Input:** String parameterClass (optional, must be valid Parameter class name from VSTO ontology)  
String startDate (optional, formatted as yyyy-mm-dd)  
int nDays (required if startDate is used, must be 1 < nDays < 31)  
String domain (optional, must be 'CEDAR' or 'MLSO')  
String instrumentClass (optional, must be valid instrument class name from VSTO ontology)

**Output:** XML/OWL document containing the Instrument instances matching the query. The XML is serialized as a String.

**Exception:** Thrown if invalid input is used in the query

**Endpoint:** <http://www.vsto.org:8080/services/VSTOQueryService>

**WSDL:** <http://www.vsto.org:8080/services/VSTOQueryService?wsdl> ←

**Example:** Find all Instruments that measure Neutral Temperature  
Input: parameterClass='NeutralTemperature', startDate=null, ndays=0, domain=null, instrumentClass=null

**Example:** Find all Instruments of type Interferometer that measured data in August 1999  
Input: parameterClass=null, startDate='1999-08-01', ndays=31, domain=null, instrumentClass='Interferometer'

### Query Input

Use the following interface to perform a live test of the VSTO Query Instrument Web Service:

**Parameter Type:**  Optional: return only instruments that measured this type of parameter  
Select from list:

**Start Date:**  (yyyy-mm-dd) **Number of Days:**  Optional: return only instruments that measured data within this time interval

**Domain:**  Optional: return only instruments in this domain

**Instrument Type:**  Optional: return only instruments of this kind  
Select from list:



# Semantic Web Services

VSTO Query Instrument Web Service

http://www.vsto.org:8080/data/queryInstrument.htm

Google

**Query Output**

Number of results returned: 13

```
<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns="http://dataportal.ucar.edu/schemas/vsto_all.owl#"
  xmlns:vsto="http://dataportal.ucar.edu/schemas/vsto.owl"
  xmlns:cedar="http://dataportal.ucar.edu/schemas/cedar.owl#"
  xmlns:mlso="http://dataportal.ucar.edu/schemas/mlso.owl#"
  xmlns:owl="http://www.w3.org/2002/07/owl#" xml:base="http://dataportal.ucar.edu/schemas/vsto_all.owl">
  <vsto:FabryPerot rdf:ID="cedar_instrument_5000">
    <vsto:hasDescription>South Pole Fabry-Perot Interfer Spectr</vsto:hasDescription>
    <vsto:hasName>SPP</vsto:hasName>
    <vsto:hasIdentifier>5000</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5015">
    <vsto:hasDescription>Arrival Heights Fabry-Perot Interf Sp</vsto:hasDescription>
    <vsto:hasName>AHF</vsto:hasName>
    <vsto:hasIdentifier>5015</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5060">
    <vsto:hasDescription>Mount John New Zealand Fabry-Perot</vsto:hasDescription>
    <vsto:hasName>MJF</vsto:hasName>
    <vsto:hasIdentifier>5060</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5140">
    <vsto:hasDescription>Arequipa, Peru Fabry-Perot</vsto:hasDescription>
    <vsto:hasName>AQF</vsto:hasName>
    <vsto:hasIdentifier>5140</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5300">
    <vsto:hasDescription>Peach Mountain Fabry-Perot</vsto:hasDescription>
    <vsto:hasName>PPF</vsto:hasName>
    <vsto:hasIdentifier>5300</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5340">
    <vsto:hasDescription>Millstone Hill Fabry-Perot</vsto:hasDescription>
    <vsto:hasName>MFP</vsto:hasName>
    <vsto:hasIdentifier>5340</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5430">
    <vsto:hasDescription>Watson Lake, Canada Fabry-Perot</vsto:hasDescription>
    <vsto:hasName>WFP</vsto:hasName>
    <vsto:hasIdentifier>5430</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5460">
    <vsto:hasDescription>College Fabry-Perot</vsto:hasDescription>
    <vsto:hasName>CFP</vsto:hasName>
    <vsto:hasIdentifier>5460</vsto:hasIdentifier>
  </vsto:FabryPerot>
  <vsto:FabryPerot rdf:ID="cedar_instrument_5465">
    <vsto:hasDescription>Poker Flat AK Scanning Imaging F-P Spec</vsto:hasDescription>
    <vsto:hasName>PKF</vsto:hasName>
```

OWL document returned using VSTO ontology - can be used both syntactically or semantically



# Semantic Web Services

VSTO Query Data Web Service

http://www.vsto.org:8080/data/queryData.htm

Guided Workflows: [Start by Instrument](#) | [Start by Dates](#) | [Start by Parameter](#)    Web Services: [Query Instrument](#) | [Query Parameter](#) | [Query Data](#)

## VSTO Web Services

### Query Data Web Service

**Description:** Web Service used to retrieve the VSTO data access URLs for a given Instrument and time interval. Optionally the results can be constrained to a specific Parameter type and/or a specific DataProduct.

**Input:** String instrumentName (mandatory, must be valid value of Instrument instance *hasName* property from VSTO ontology)  
String startDate (mandatory, formatted as yyyy-mm-dd)  
int nDays (mandatory, must be 1 < nDays < 31)  
String parameterClass (optional, must be valid Parameter class name from VSTO ontology)  
String dataProduct (optional, must be valid DataProduct class name OR valid DataProduct instance name from VSTO ontology)

**Output:** XML/OWL document containing the DataProduct URLs matching the query. The XML is serialized as a String.

**Exception:** Thrown if invalid input is used in the query

**Endpoint:** <http://www.vsto.org:8080/services/VSTOQueryService>

**WSDL:** <http://www.vsto.org:8080/services/VSTOQueryService?wsdl>

**Example:** Find all data access URLs for data measured by the Instrument Millston Hill Fabry Perot in January 2000  
Input: instrumentName='MFP', startDate='2000-01-01', ndays=31, parameterClass=null, dataProduct=null

**Example:** Find the OPeNDAP URL for the Neutral Temperature data measured by the Instrument Millston Hill Fabry Perot in January 2000  
Input: instrumentName='MFP', startDate='2000-01-01', ndays=31, parameterClass='NeutralTemperature', dataProduct='OpendapDataFile'

**Example:** Find the URLs for all the Images taken by the MLSO Mark IV instrument at the beginning of June 2004  
Input: instrumentName='MK4', startDate='2004-06-01', ndays=3, parameterClass=null, dataProduct=null

**Example:** Find the URLs for the best Polarization Brightness Images in Polar Coordinates taken by the MLSO Mark IV instrument during June 2004  
Input: instrumentName='MK4', startDate='2004-06-01', ndays=30, parameterClass=null, dataProduct='mlso:mlso\_data\_image\_mk\_cpb\_best'

#### Query Input

Use the following interface to perform a live test of the VSTO Query Data Web Service (\* denotes a mandatory parameter).

**Instrument Name: (\*)**  Mandatory: specify the instrument that measured the data  
Select from list:

**Start Date: (\*)**  (yyyy-mm-dd) **Number of Days: (\*)**  Mandatory: specify the time interval when data was measured

**Parameter Type:**  Optional: return only URLs for this kind of Parameter  
Select from list:

**Data Product Type:**  Optional: select one of the data products available for CEDAR or MLSO instruments  
Select CEDAR data product:     Select MLSO data product:



# Semantic Web Services

```
VSTO Query Data Web Service
Query Output

Number of results returned: 7000

<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns="http://dataportal.ucar.edu/schemas/vsto_all.owl#"
  xmlns:vsto="http://dataportal.ucar.edu/schemas/vsto.owl"
  xmlns:cedar="http://dataportal.ucar.edu/schemas/cedar.owl#"
  xmlns:mlso="http://dataportal.ucar.edu/schemas/mlso.owl#"
  xmlns:owl="http://www.w3.org/2002/07/owl#" xml:base="http://dataportal.ucar.edu/schemas/vsto_all.owl">
  <vsto:JpgDataImage>
    <vsto:hasURI>http://download.hao.ucar.edu/2006/01/02/20060102.174055.chp.bsh.jpg</vsto:hasURI>
  </vsto:JpgDataImage>
  <vsto:FitsDataImage>
    <vsto:hasURI>http://mlso.hao.ucar.edu/archive/acos/2006/01/02/20060102.174055.chp.bsh.fts.gz</vsto:hasURI>
  </vsto:FitsDataImage>
  <vsto:DasDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174055.chp.bsh.fts.gz.das</vsto:hasURI>
  </vsto:DasDataFile>
  <vsto:DdsDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174055.chp.bsh.fts.gz.dds</vsto:hasURI>
  </vsto:DdsDataFile>
  <vsto:OpendapDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174055.chp.bsh.fts.gz.dods</vsto:hasURI>
  </vsto:OpendapDataFile>
  <vsto:AsciiDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174055.chp.bsh.fts.gz.asc</vsto:hasURI>
  </vsto:AsciiDataFile>
  <vsto:HtmlDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174055.chp.bsh.fts.gz.html</vsto:hasURI>
  </vsto:HtmlDataFile>
  <vsto:JpgDataImage>
    <vsto:hasURI>http://download.hao.ucar.edu/2006/01/02/20060102.174307.chp.bsh.jpg</vsto:hasURI>
  </vsto:JpgDataImage>
  <vsto:FitsDataImage>
    <vsto:hasURI>http://mlso.hao.ucar.edu/archive/acos/2006/01/02/20060102.174307.chp.bsh.fts.gz</vsto:hasURI>
  </vsto:FitsDataImage>
  <vsto:DasDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174307.chp.bsh.fts.gz.das</vsto:hasURI>
  </vsto:DasDataFile>
  <vsto:DdsDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174307.chp.bsh.fts.gz.dds</vsto:hasURI>
  </vsto:DdsDataFile>
  <vsto:OpendapDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174307.chp.bsh.fts.gz.dods</vsto:hasURI>
  </vsto:OpendapDataFile>
  <vsto:AsciiDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174307.chp.bsh.fts.gz.asc</vsto:hasURI>
  </vsto:AsciiDataFile>
  <vsto:HtmlDataFile>
    <vsto:hasURI>http://mlso.hao.ucar.edu/cgi-bin/nph-dods/2006/01/02/20060102.174307.chp.bsh.fts.gz.html</vsto:hasURI>
  </vsto:HtmlDataFile>
  <vsto:JpgDataImage>
    <vsto:hasURI>http://download.hao.ucar.edu/2006/01/02/20060102.174607.chp.bsh.jpg</vsto:hasURI>
  </vsto:JpgDataImage>
  <vsto:FitsDataImage>
```



# Semantic Web Benefits

- Unified/ abstracted query workflow: Parameters, Instruments, Date-Time **across widely different disciplines**
- Decreased input requirements for query: in one case reducing the number of selections from **eight to three**
- Semantic query support: by using background ontologies and a reasoner, our application has the opportunity to **only expose coherent queries** (portal and services)
- Semantic integration: in the past users had to remember (and maintain codes) to account for numerous different ways to combine and plot the data whereas now semantic mediation provides the level of sensible data integration required, ***now exposed as smart web services***
  - understanding of coordinate systems, relationships, data synthesis, transformations, etc.
  - returns independent variables and related parameters
- A **broader range of potential users** (PhD scientists, students, professional research associates and those from outside the fields)
- VSTO: <http://vsto.hao.ucar.edu>, <http://www.vsto.org>, <http://www.voig.net>
- Peter Fox [pfox@ucar.edu](mailto:pfox@ucar.edu)



<http://www.voig.net> ([voig@egy.org](mailto:voig@egy.org))

Second conference September 2008



# VSTO – semantics and ontologies in an operational environment: [vsto.hao.ucar.edu](http://vsto.hao.ucar.edu), [www.vsto.org](http://www.vsto.org)

