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

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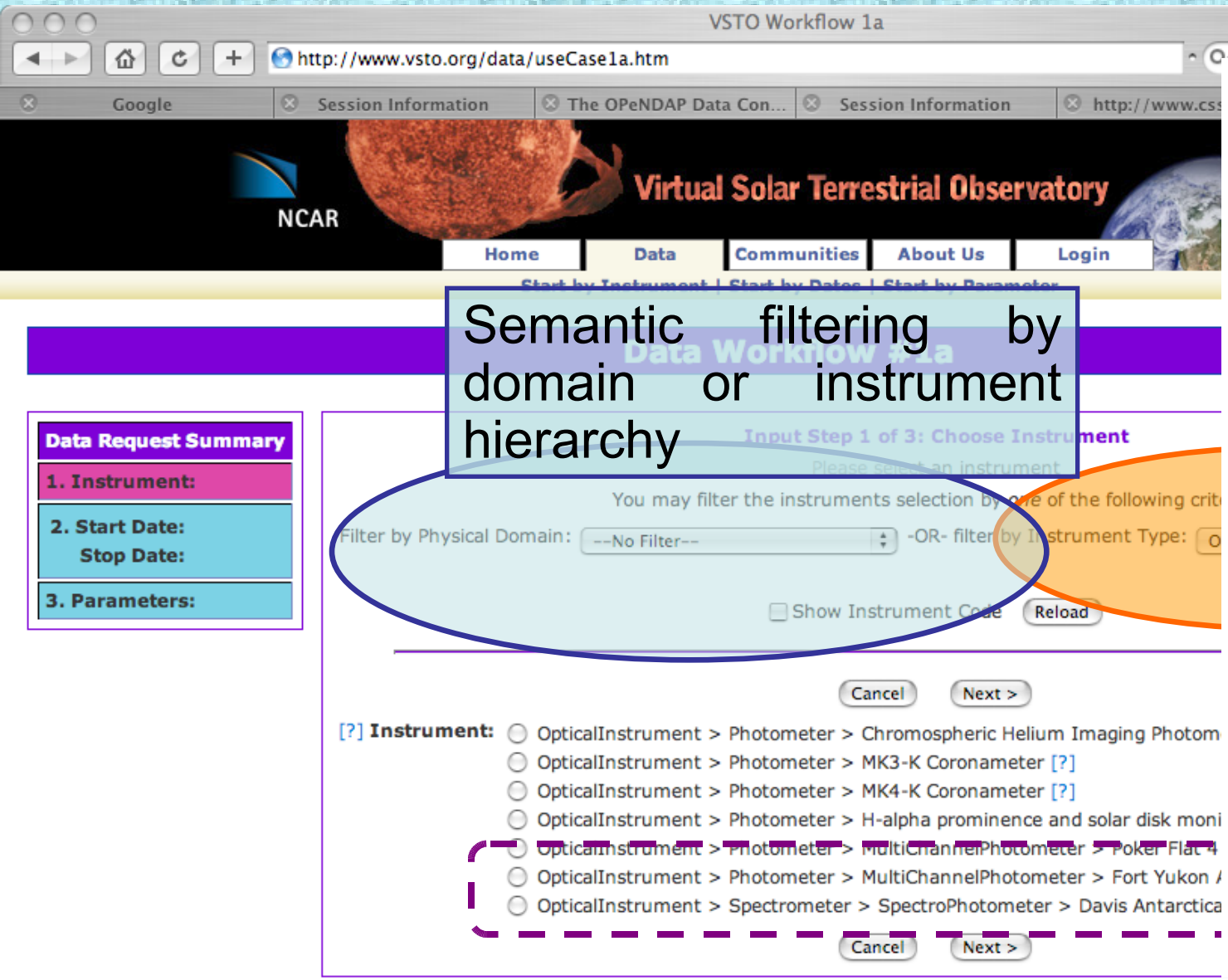
Project funded by NSF/OCI

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



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, …

NCAR

Virtual Solar Terrestrial Observatory

Home | Data | Communities | About Us | Login

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 [?]

Avalaible Output

The following data products match the current selection:

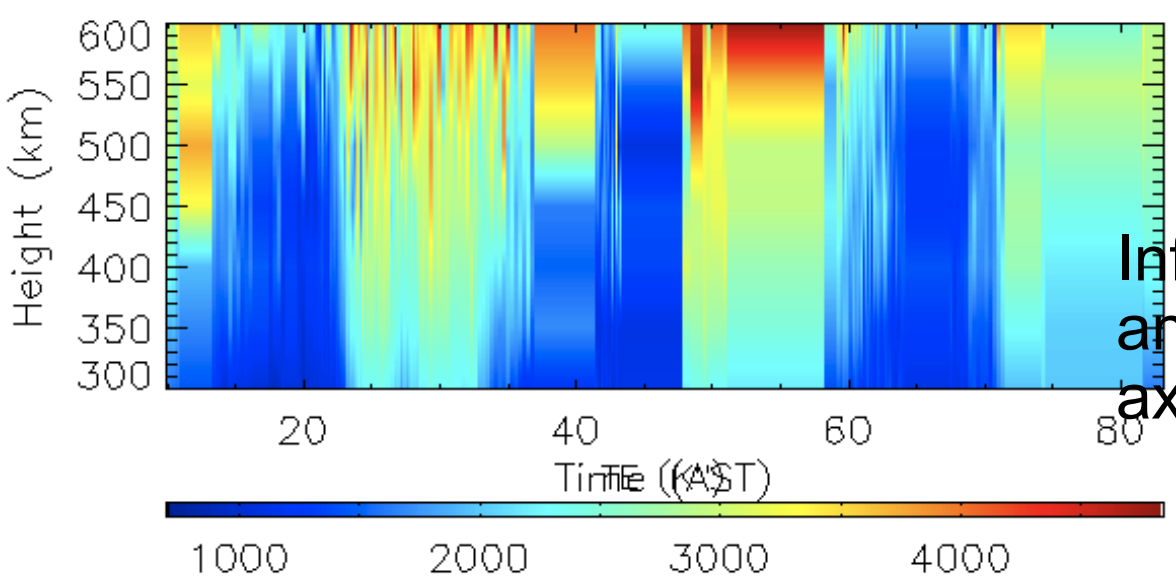
Data Files: TAB [?] FLAT [?] INFO [?] DAS [?] DDS [?] OPeNDAP [?] STREAM [?] IDL [?]

Data Plots: Height vs Time [?]

Change Input

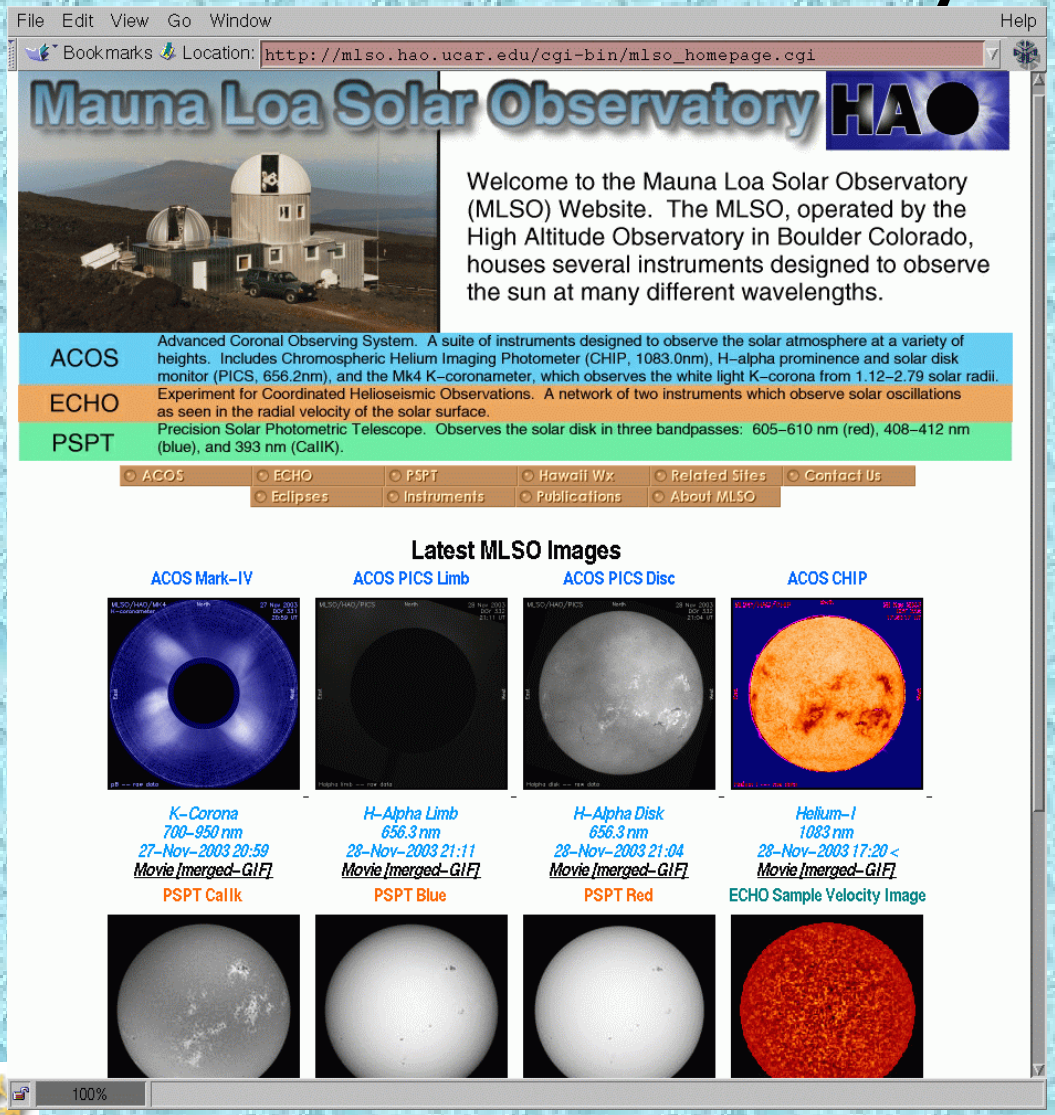
Click on the Back button to change your data selection, or Cancel to end the workflow

< Back Cancel



Inferred plot type and return required axes data

Content: Mauna Loa Solar Observatory

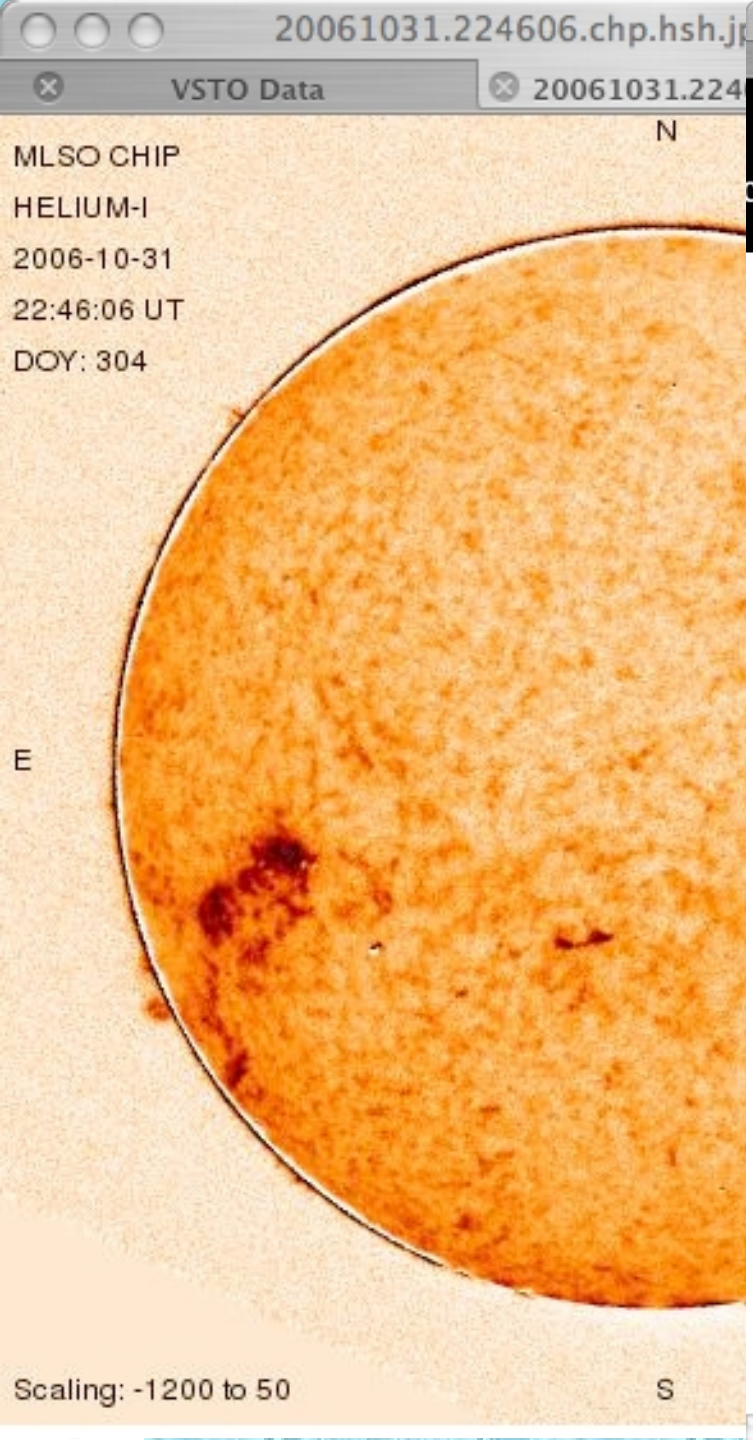


Near real-time data from Hawaii from a variety of solar instruments.

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

Other content

- CISM – Center for Integrated Space Weather Modeling



VSTO Data

VSTO Data | 20061031.224606.chp.h...

CAR

Virtual Solar Terrestrial Observatory

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
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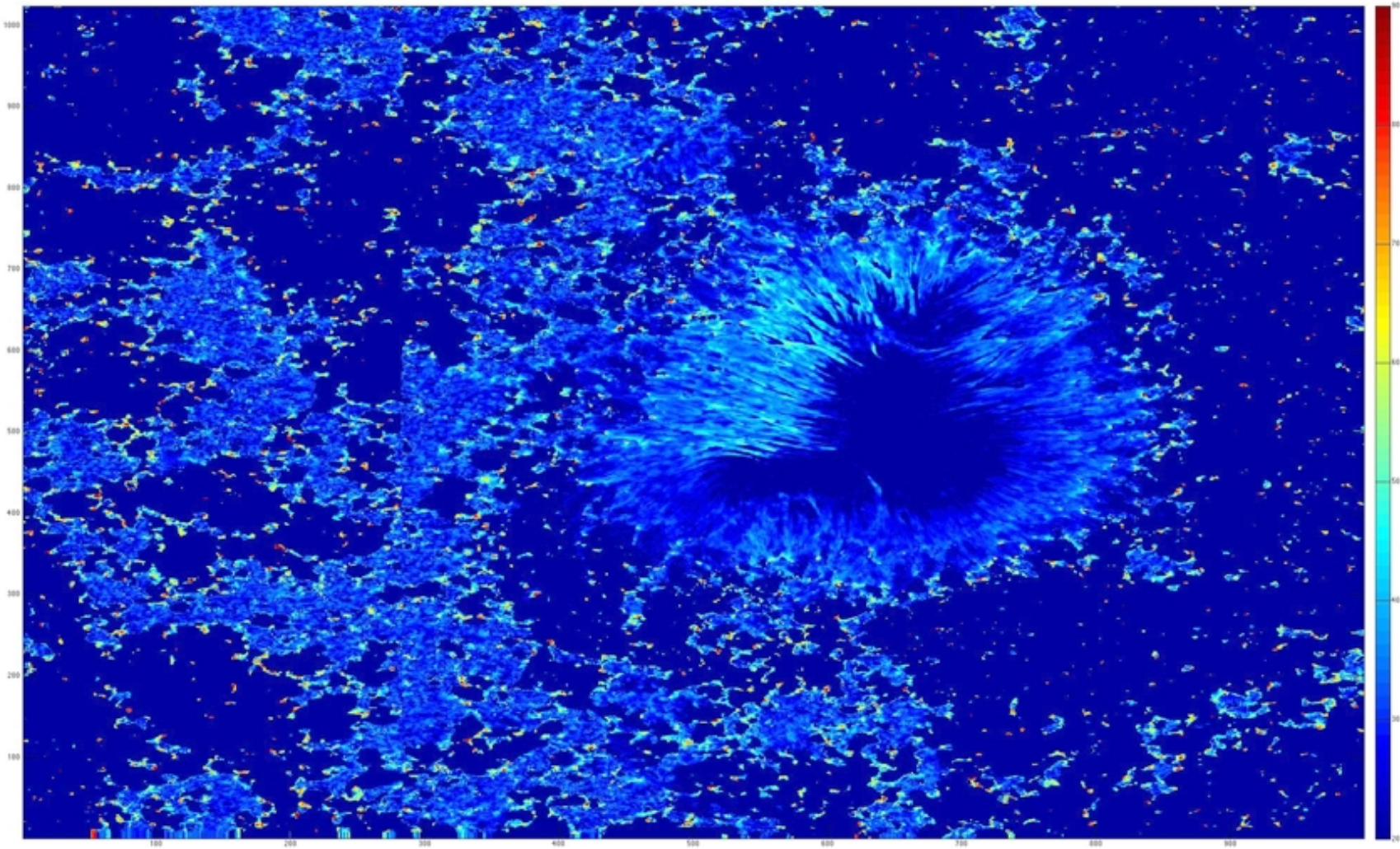
- 20061029.183906.chp.hsh: JPG FTS DAS DDS OPeNDAP ASC HTML
- 20061029.184206.chp.hsh: JPG FTS DAS DDS OPeNDAP ASC HTML

HINODE_20070502_SDOP.jpg 2528×1452 pixels

VSTO Workflow 1a | HINODE_20070502_SDO... | HINODE_20070502_SPSI.... | VSTO Data

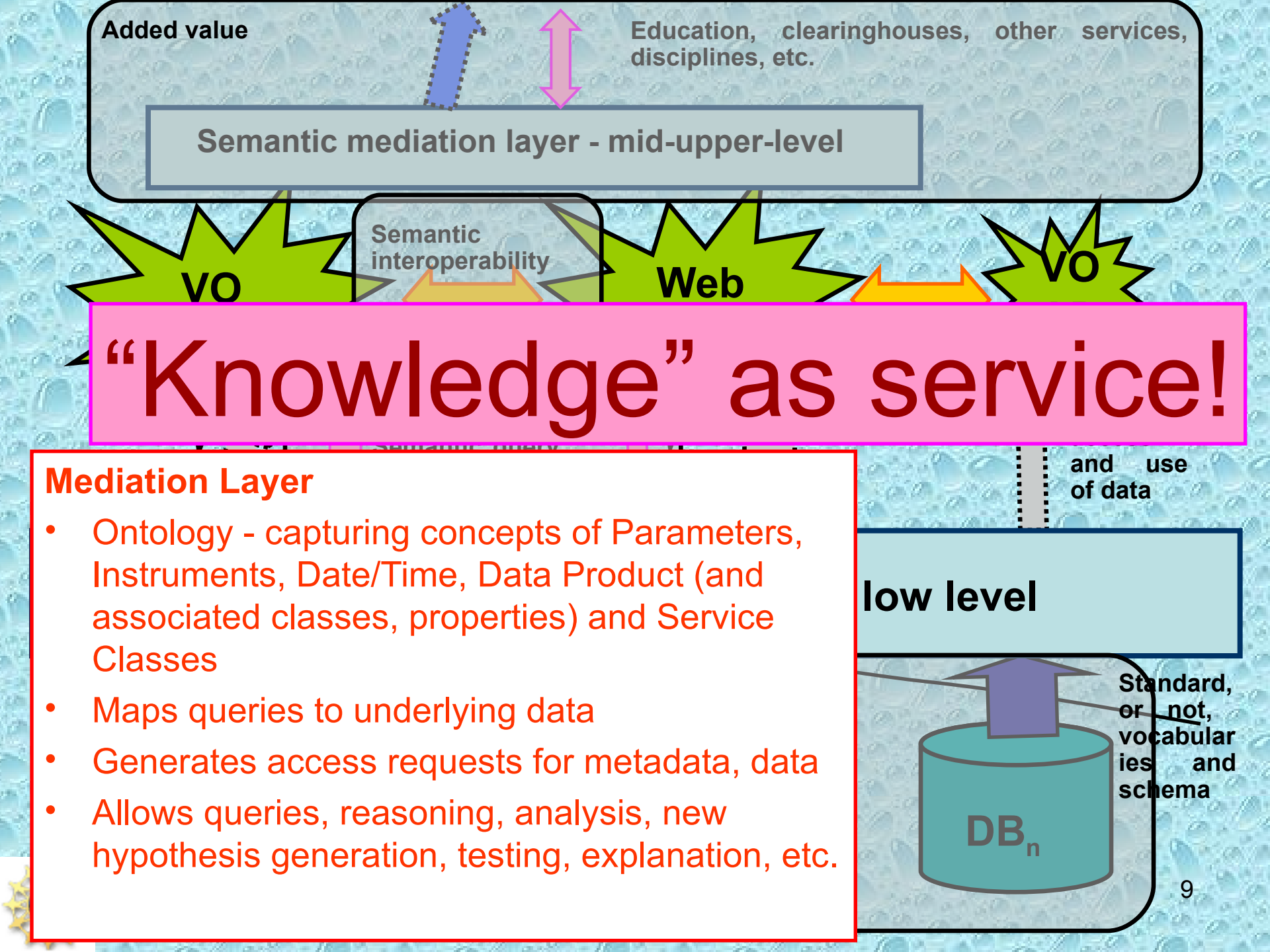


E.g. Science and technical use cases

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

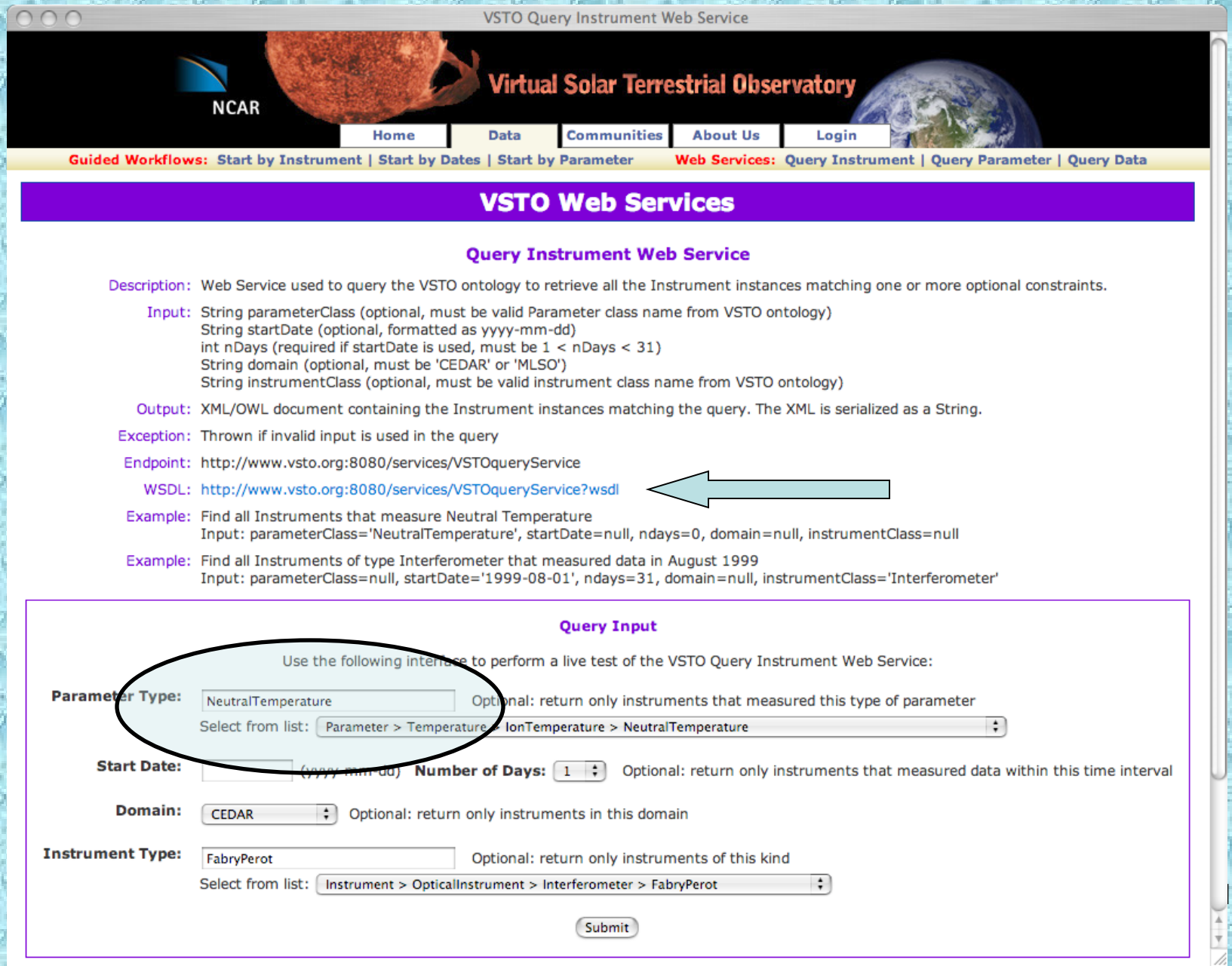
Provide semantically-enabled, smart data query services via a SOAP web for the Virtual Ionosphere-Thermosphere-Mesosphere Observatory that retrieve data, filtered by constraints on Instrument, Date-Time, and Parameter in any order and with constraints included in any combination.



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.

Semantic Web Services



Semantic Web Services

VSTO Query Instrument Web Service

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

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">
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    <vsto:hasName>SPF</vsto:hasName>
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    <vsto:hasIdentifier>5060</vsto:hasIdentifier>
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  <vsto:FabryPerot rdf:ID="cedar_instrument_5460">
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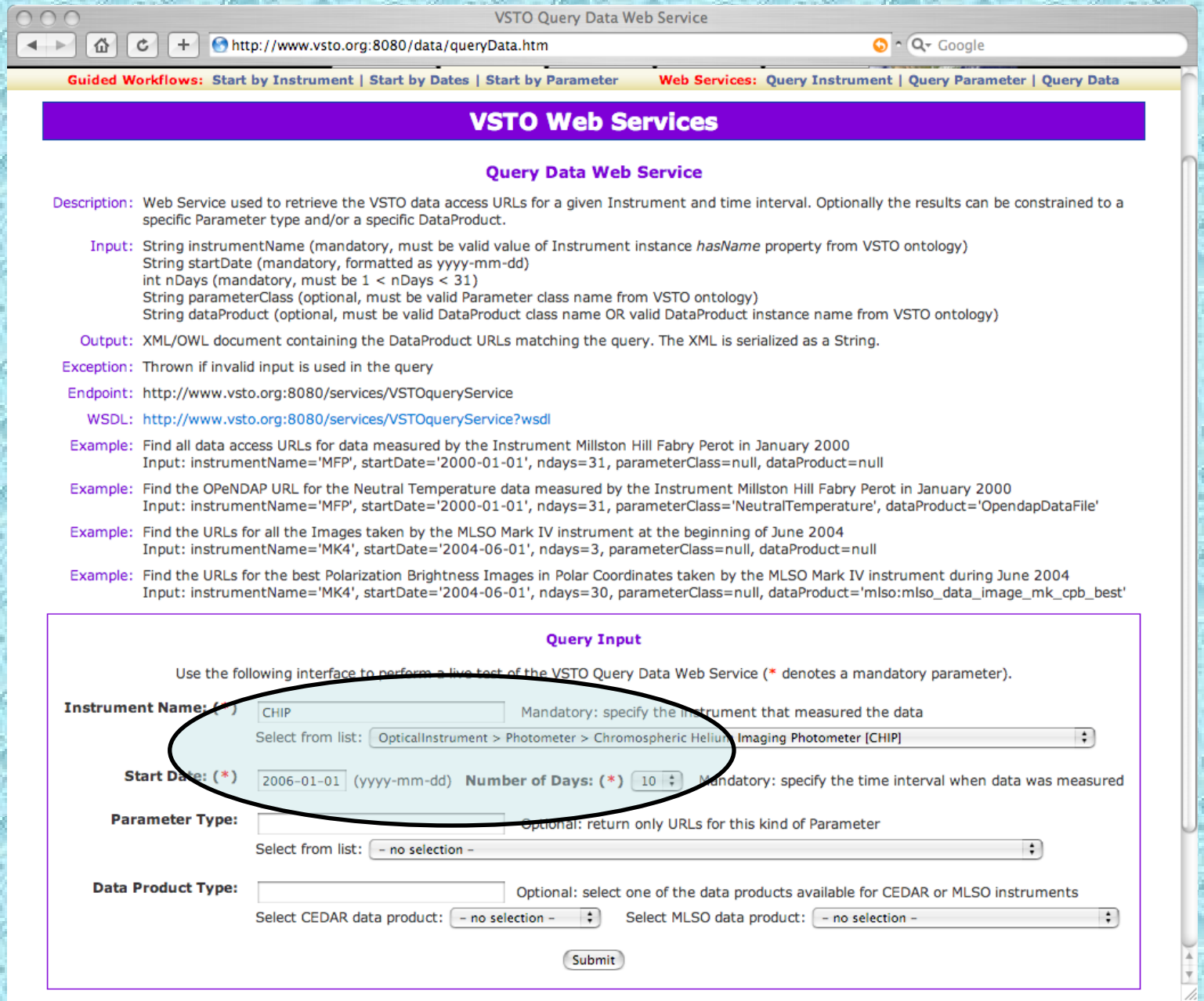
OWL document returned using VSTO ontology - can be used both syntactically or semantically

Semantic Web Services



Semantic Web Services

VSTO Query Data Web Service

Query Output

Number of results returned: 7000

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        xmlns:cedar="http://dataportal.ucar.edu/schemas/cedar.owl#"
        xmlns:mlso="http://dataportal.ucar.edu/schemas/mlso.owl#"
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```

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

http://www.voig.net (voig@egy.org)

Second conference September 2008

VSTO – semantics and ontologies in an operational environment: vsto.hao.ucar.edu, www.vsto.org