Accessing Madrigal data via python

Bill Rideout
MIT Haystack Observatory
brideout@haystack.mit.edu

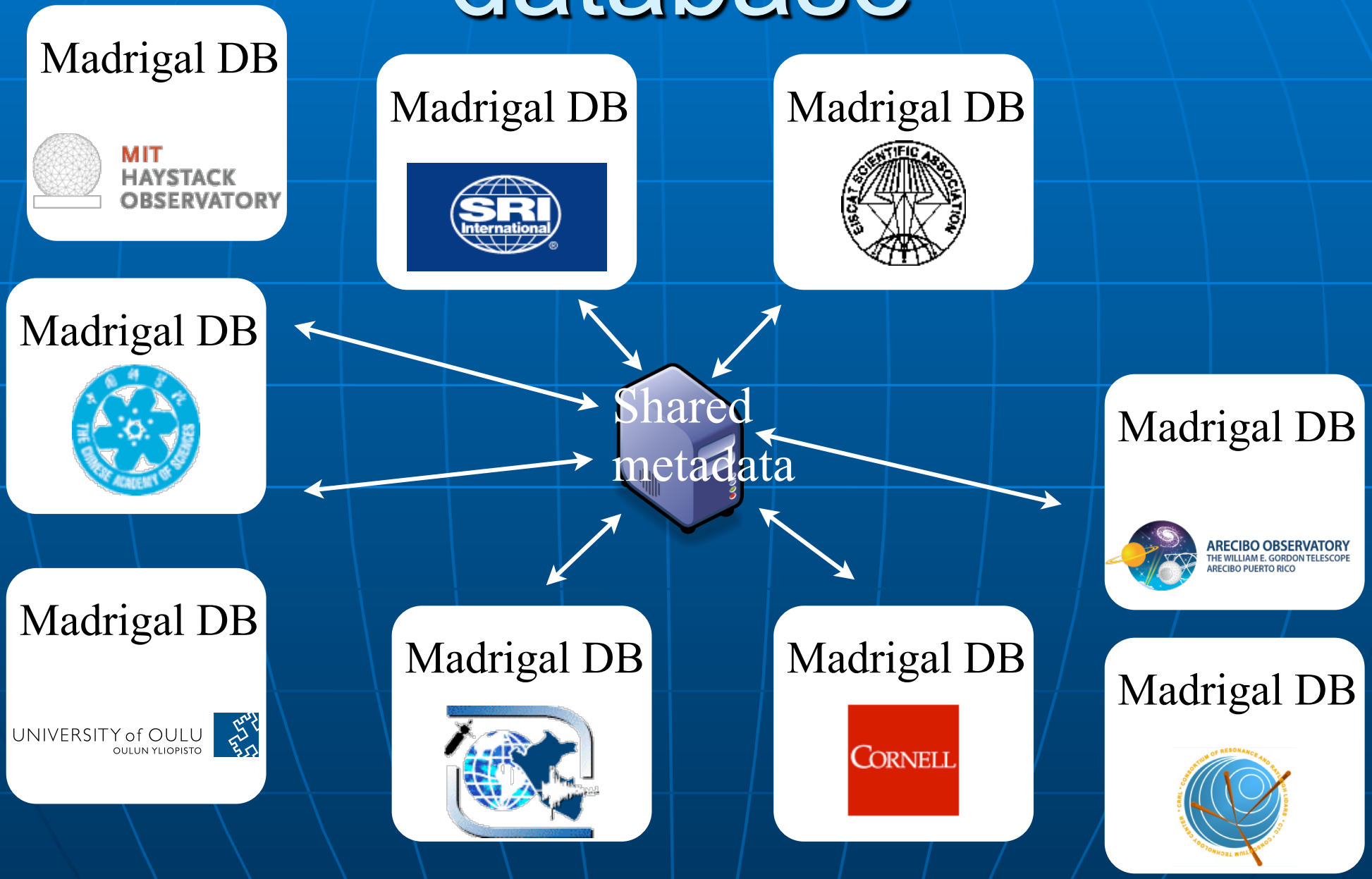
CEDAR workshop
2016

Outline

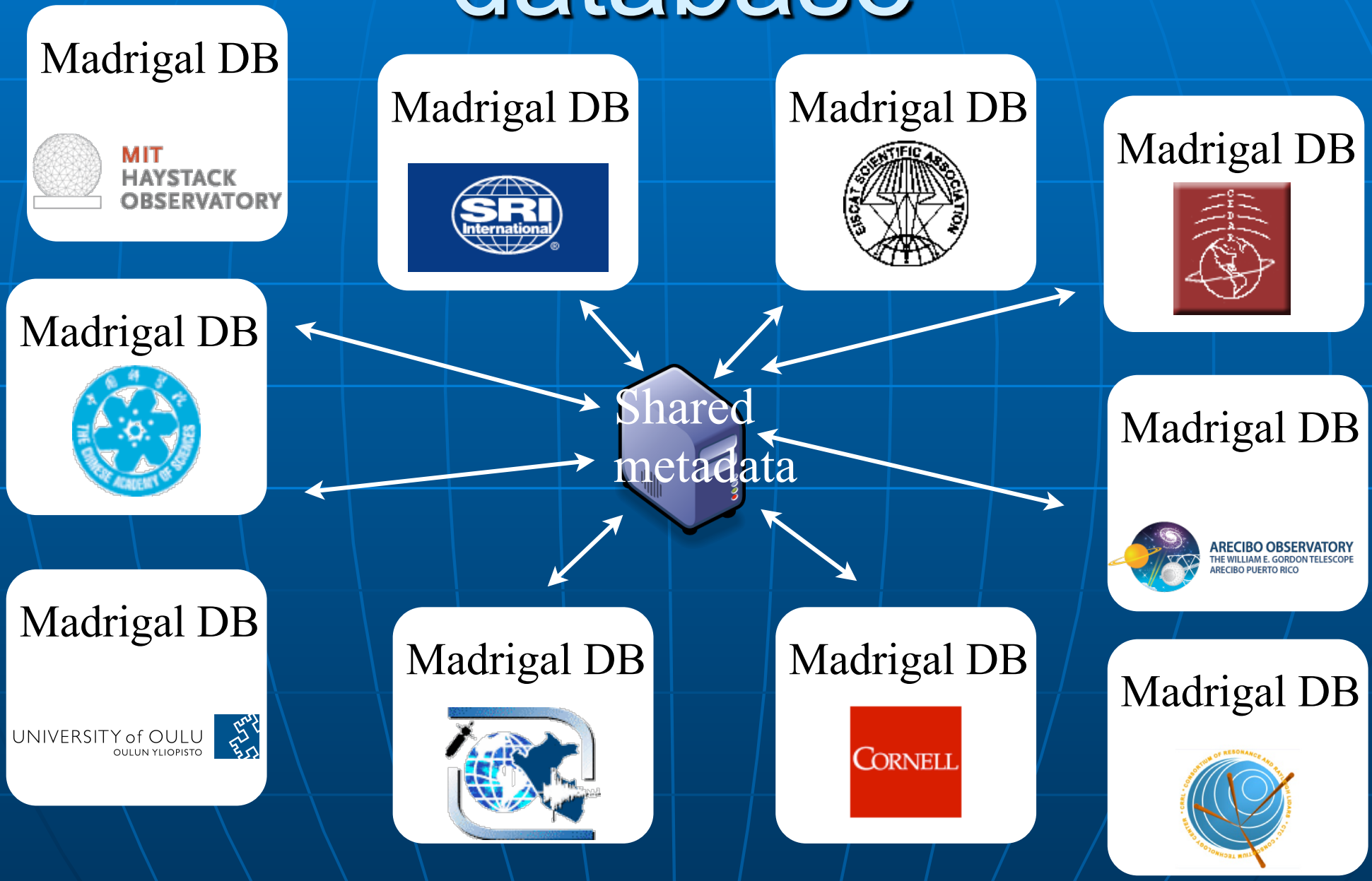
- What is Madrigal?
- Generating python commands via the web interface
- Calling the API with your own python script

What is Madrigal?

Madrigal is a distributed database



Madrigal is a distributed database



Cedar Madrigal archive imports all data weekly

Madrigal DB

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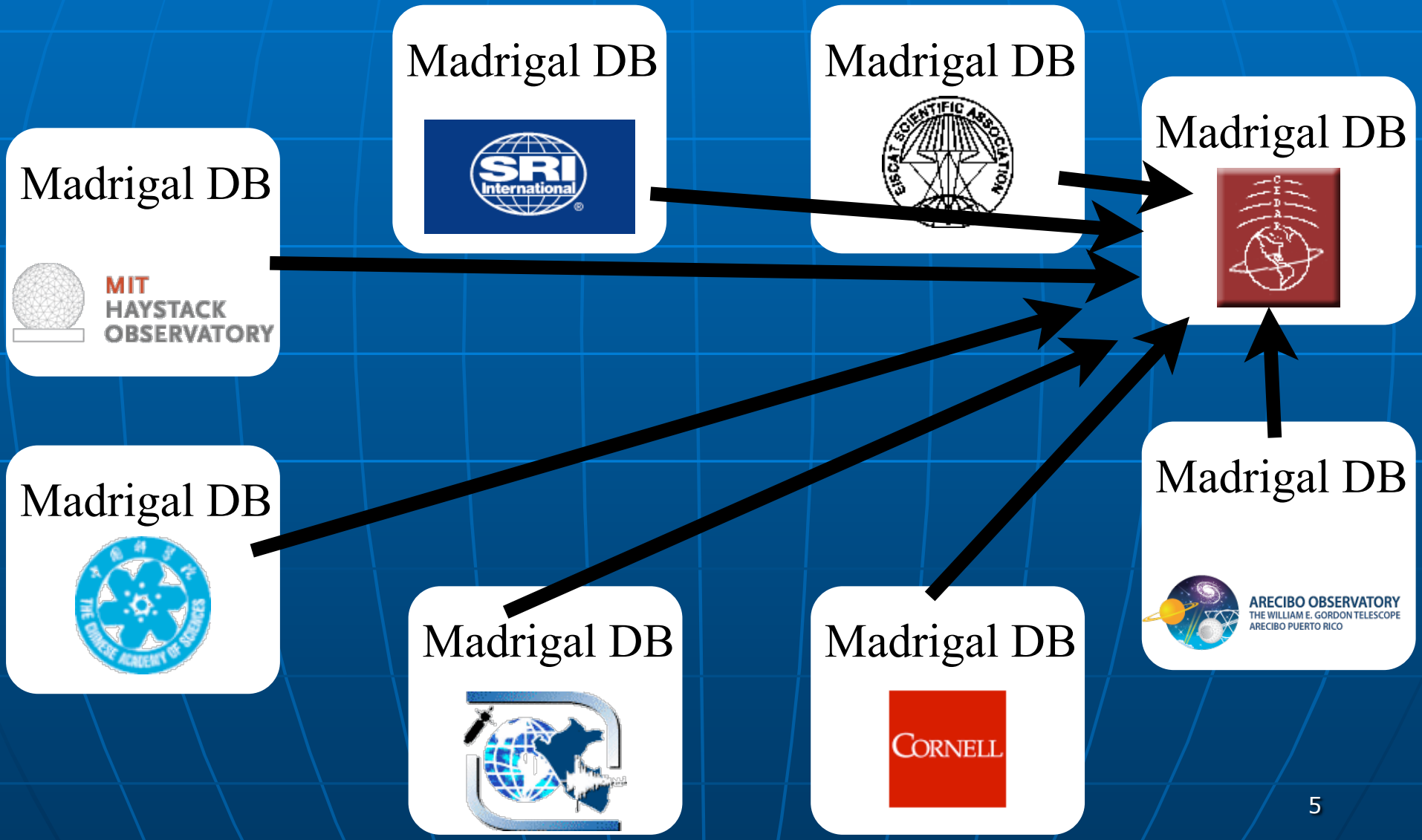


The Madrigal database stores data from a wide variety of upper atmosphere research instruments

Incoherent Scatter Radar

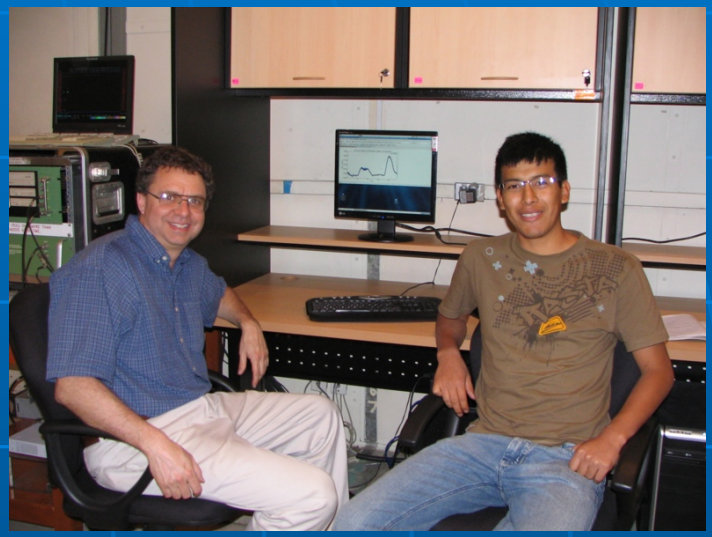
TEC via GPS

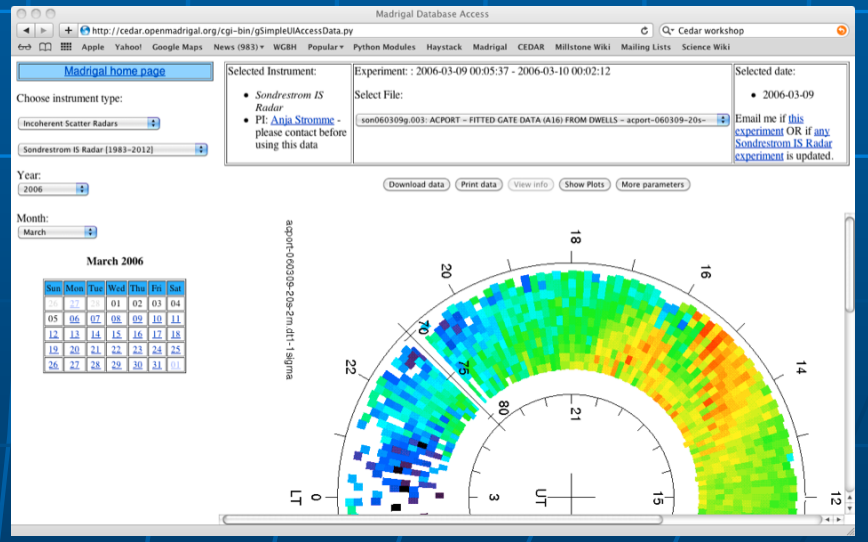
MF Radar

Number of instruments in Madrigal:

- Incoherent scatter radars: 22
- MST radars: 3
- MF radars: 16
- Meteor radars: 7
- FPI: 23
- Michelson Interferometers: 6
- Lidars: 4
- Photometers: 4

Madrigal is open-source





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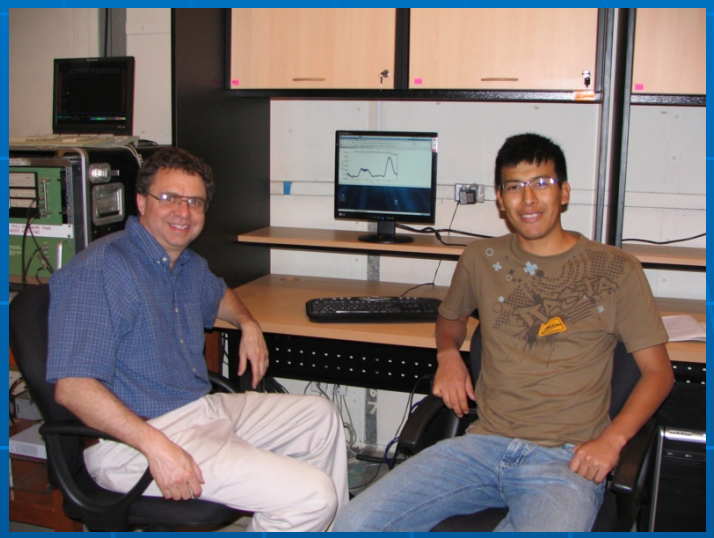
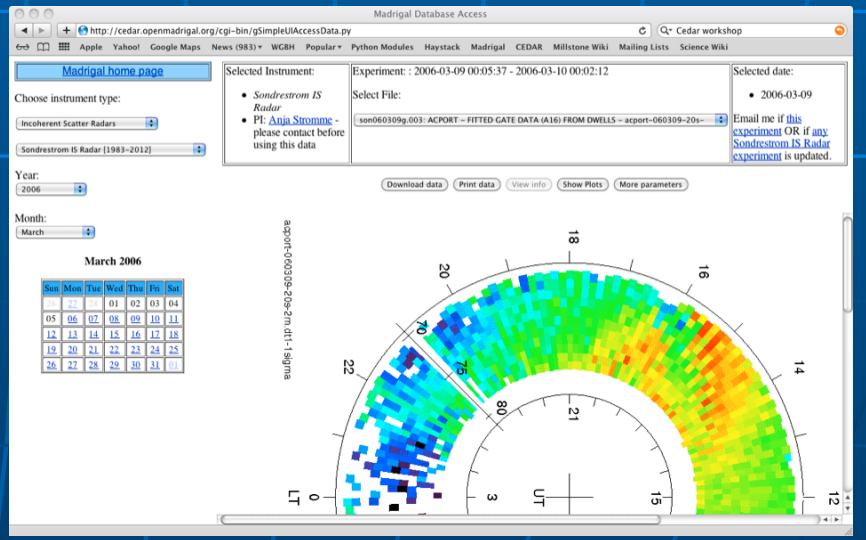
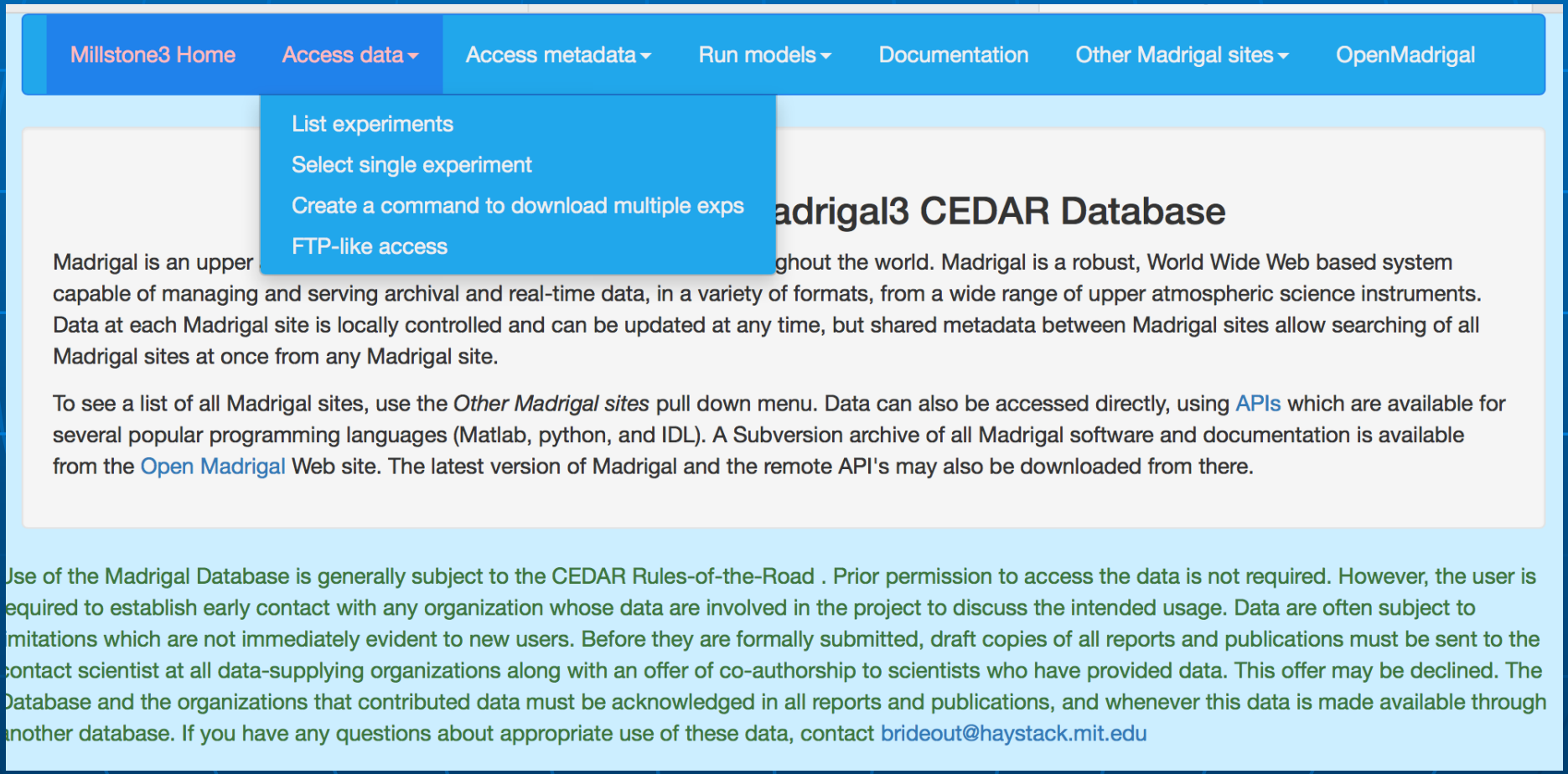
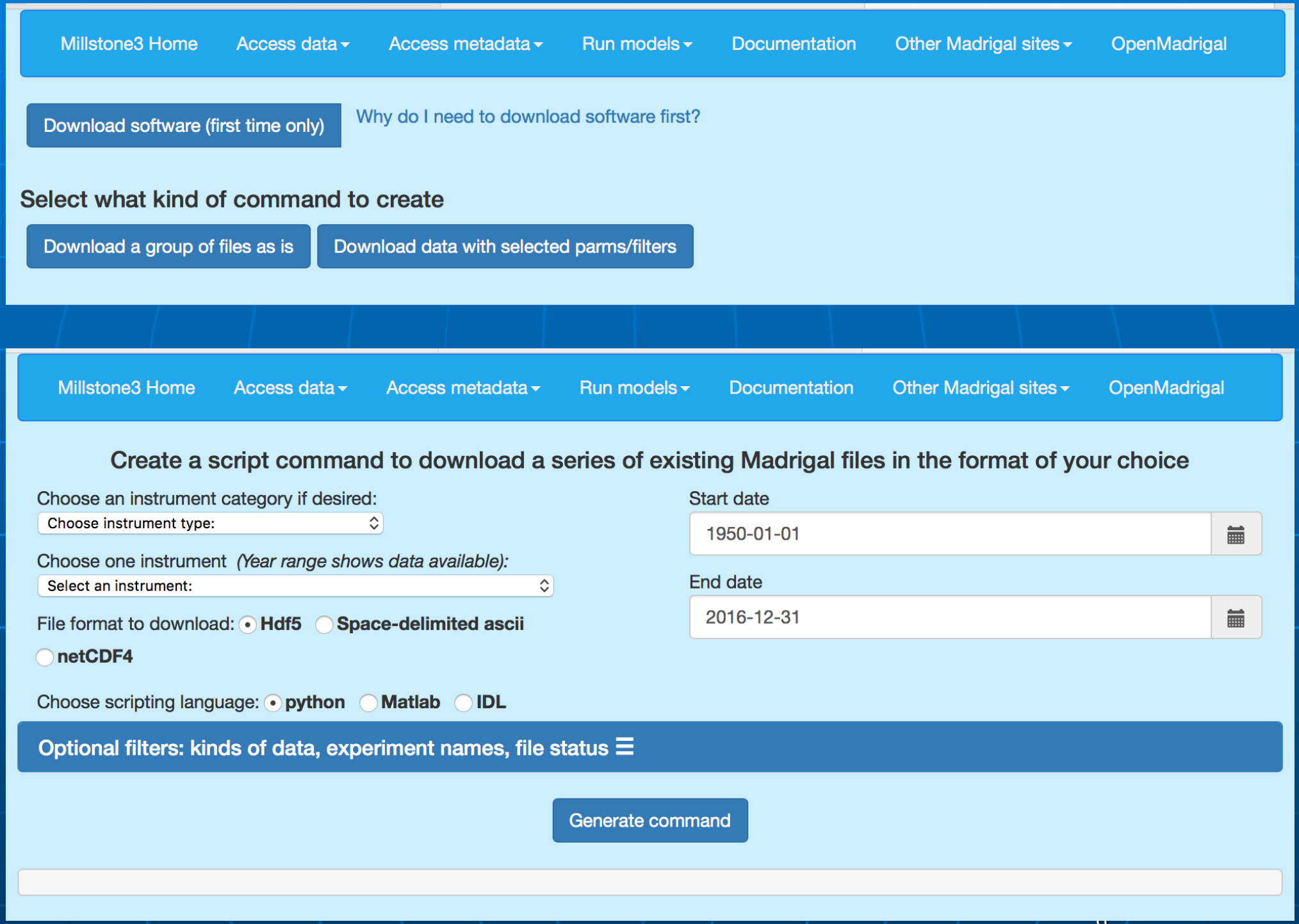


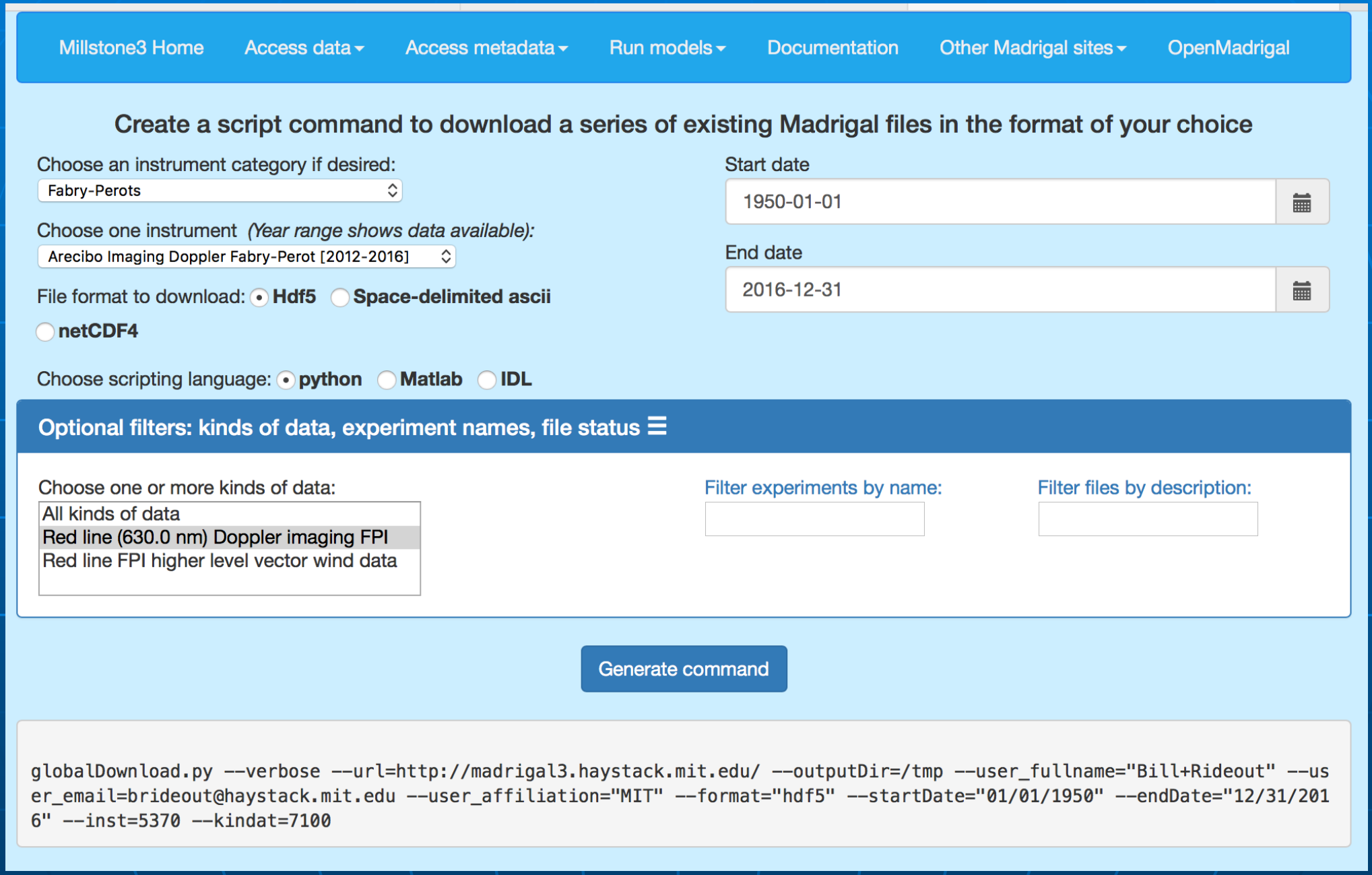


www.openmadrigal.org

Generating python commands via the web interface




Millstone3 Home
Access data
Access metadata
Run models
Documentation
Other Madrigal sites
OpenMadrigal
Download software (first time only)
Why do I need to download software first?
Select what kind of command to create
Download a group of files as is
Download data with selected parms/filters
Millstone3 Home
Access data
Access metadata
Run models
Documentation
Other Madrigal sites
OpenMadrigal
Create a script command to download a series of existing Madrigal files in the format of your choice
Choose an instrument category if desired:
Choose instrument type:
Choose one instrument (Year range shows data available):
Select an instrument:
File format to download: Hdf5 Space-delimited ascii
netCDF4
Choose scripting language: python Matlab IDL
Start date
1950-01-01
End date
2016-12-31
Optional filters: kinds of data, experiment names, file status
Generate command


Millstone3 Home
Access data
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Other Madrigal sites
OpenMadrigal
Create a script command to download a series of existing Madrigal files in the format of your choice
Choose an instrument category if desired:
Fabry-Perots
Choose one instrument (Year range shows data available):
Arecibo Imaging Doppler Fabry-Perot [2012-2016]
File format to download: Hdf5 Space-delimited ascii
netCDF4
Choose scripting language: python Matlab IDL
Start date
1950-01-01
End date
2016-12-31
Optional filters: kinds of data, experiment names, file status
Choose one or more kinds of data:
All kinds of data
Red line (630.0 nm) Doppler imaging FPI
Red line FPI higher level vector wind data
Filter experiments by name:
Filter files by description:
Generate command
globalDownload.py --verbose --url=http://madrigal3.haystack.mit.edu/ --outputDir=/tmp --user_fullname="Bill+Rideout" --user_email=brideout@haystack.mit.edu --user_affiliation="MIT" --format="hdf5" --startDate="01/01/1950" --endDate="12/31/2016" --inst=5370 --kindat=7100

Download software (first time only) Why do I need to download software first?

Select what kind of command to create

Download a group of files as is | Download data with selected parms/filters

Millstone3 Home | Access data | Access metadata | Run models | Documentation | Other Madrigal sites | OpenMadrigal

Create a script command to download Madrigal data with selected parameters and filters

Choose an instrument category if desired:

Fabry-Perots

Choose one instrument *(Year range shows data available):*

Arecibo Imaging Doppler Fabry-Perot [2012-2016]

File format to download: (•) **Hdf5** ( ) **Space-delimited ascii** ( ) **netCDF4**

Choose scripting language: (•) **python** ( ) **Matlab** ( ) **IDL**

Start date

1950-01-01

End date

2016-12-31

Select parameters (required) ☰

Optional filters: kinds of data, filter by parm, experiment names, etc ☰

Generate command

Millstone3 Home | Access data | Access metadata | Run models | Documentation | Other Madrigal sites | OpenMadrigal

Create a script command to download Madrigal data with selected parameters and filters

Choose an instrument category if desired:

Fabry-Perots

Choose one instrument *(Year range shows data available):*

Arecibo Imaging Doppler Fabry-Perot [2012-2016]

File format to download: **Hdf5** **Space-delimited ascii** **netCDF4**

Choose scripting language: **python** **Matlab** **IDL**

Start date

1950-01-01

End date

2016-12-31

Select parameters (required)

Madrigal Hdf5 Prolog Parameters

MONTH | DAY | HOUR | MIN | SEC

YEAR | UT1_UNIX | UT2_UNIX | KINST | RECNO

KINDAT

Time Related Parameter

BYEAR | CSEC | BMD | BMONTH | BDAY

MD | DAYNO | BHM | BHHMMSS | EHHMMSS

HM | UTH | UTS | B_UTH | INTTMS

Choose scripting language: ● **python** ○ **Matlab** ○ **IDL**

Select parameters (required) ☰

Optional filters: kinds of data, filter by parm, experiment names, etc ☰

Choose one or more kinds of data:

- All kinds of data
- Red line (630.0 nm) Doppler imaging FPI
- Red line FPI higher level vector wind data

Filter experiments by name:

Filter files by description:

Select data from only a part of the year by changing the values below:

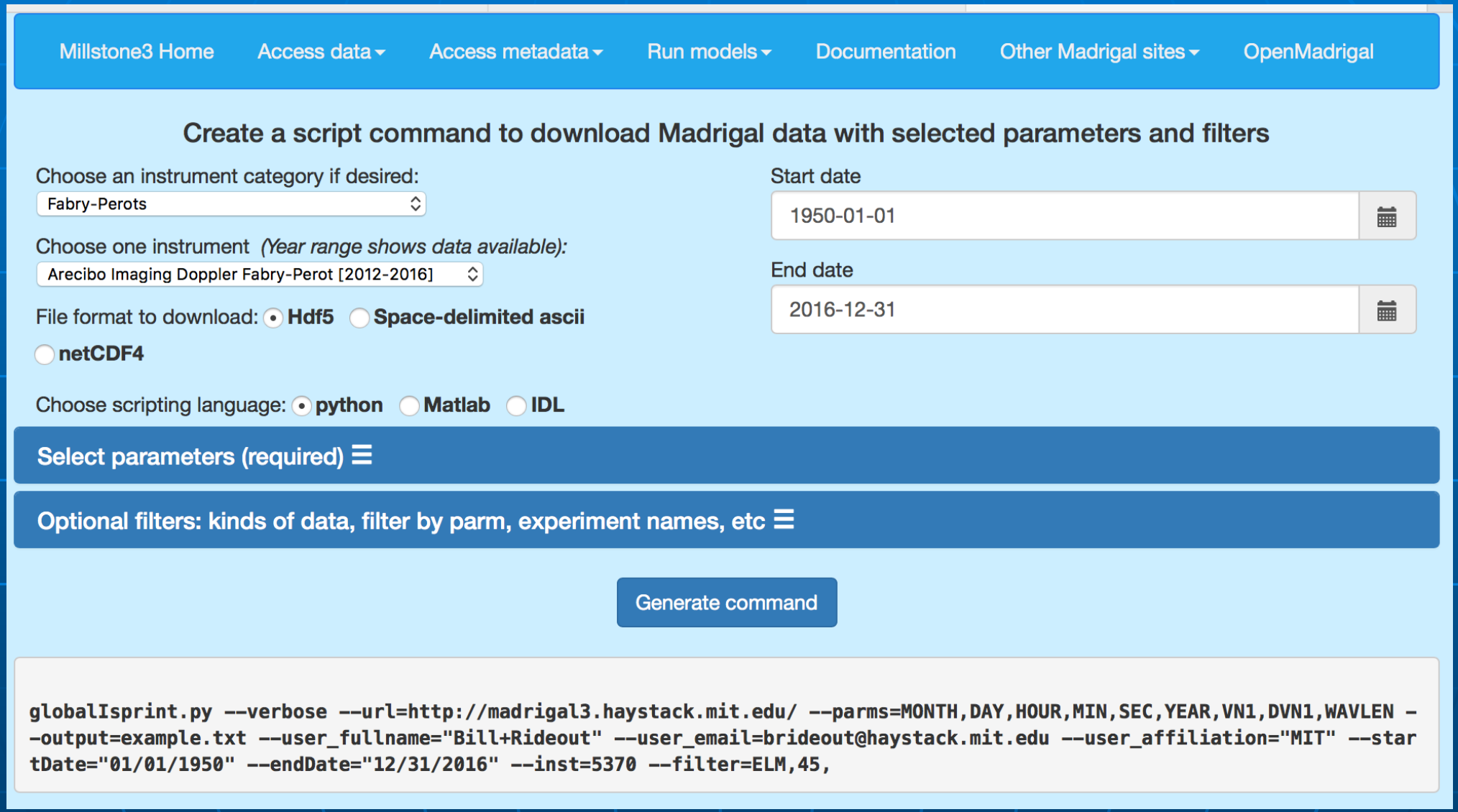
Optional seasonal start day/month: 1 / 1

Optional seasonal end day/month: 31 / 12

Add optional filters based on parameter values below:

Optional filters using any parameter mnemonic for this instrument	Lower limit (leave blank if no lower limit)	Upper limit (leave blank if no upper limit)
ELM	45	
None		
None		

Generate command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Choose scripting language: python Matlab IDL
Start date
1950-01-01
End date
2016-12-31
Select parameters (required)
Optional filters: kinds of data, filter by parm, experiment names, etc
Generate command
globalIsprint.py --verbose --url=http://madrigal3.haystack.mit.edu/ --parms=MONTH,DAY,HOUR,MIN,SEC,YEAR,VN1,DVN1,WAVLEN --output=example.txt --user_fullname="Bill+Rideout" --user_email=brideout@haystack.mit.edu --user_affiliation="MIT" --startDate="01/01/1950" --endDate="12/31/2016" --inst=5370 --filter=ELM,45,

Calling the API with your own python script

jupyter Madrigal_python_demo Last Checkpoint: Last Friday at 11:17 AM (unsaved changes)

File Edit View Insert Cell Kernel Help Python 2

Markdown CellToolbar

An introduction to using python to access Madrigal data (madrigalWeb)

This notebook available at http://www.haystack.mit.edu/~brideout/Madrigal_python_demo.ipynb

To download the latest Python Madrigal API, go to http://madrigal.haystack.edu/madrigal/madDownload.html, or use pip:

```
pip install madrigalWeb
```

Then feel free to follow along with this talk!

Url of present Madrigal CEDAR database: http://cedar.openmadrigal.org Url of Madrigal 3 CEDAR database beta site: http://madrigal3.haystack.mit.edu

When Madrigal 3 is released, http://cedar.openmadrigal.org will be Madrigal 3.

Online resources: Tutorial and Reference

Any questions: Email me (Bill Rideout) at brideout@haystack.mit.edu

In [1]:
```
import madrigalWeb.madrigalWeb
```

The next command connects to one particular Madrigal site, and creates an object we will use for the rest of the session. Because there are some new features in Madrigal 3, we connect to that site.

In [9]:
```
madDB = madrigalWeb.madrigalWeb.MadrigalData('http://madrigal3.haystack.mit.edu')
```