

# EISCAT

## getting data

Thomas Ulich



# Scientist's Day

- I have a project, but now I need to:
  - Search numerous websites for data
  - Figure out their parameters, units
  - Figure out their co-ordinate system, date format
  - Figure out how to determine data quality
  - Write code to download data, or download manually
  - Write code to convert to your format
  - Finally, do science

For EISCAT,  
MADRIGAL is the solution!



# Madrigal?

- ✦ [www.openmadrigal.org](http://www.openmadrigal.org)
  - ✦ Database designed to hold one group's data
  - ✦ Open source
  - ✦ Web based
  - ✦ Designed for a wide variety of instruments
  - ✦ Built on the CEDAR database format



# Madrigal Data Model

## Madrigal Site

(typically a facility with scientists and a Madrigal installation)

## Instruments

(ground-based typically with a set of locations)

## Experiments

(typically of limited duration)

Data shared  
among all  
Madrigal sites

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## Experiment Files

(data from one analysis of the experiment)

## Records

(measurement over one period of time)

Data unique  
to one  
Madrigal site



# Madrigal Records

- ✧ A record is a measurement over one period of time.
- ✧ Three types:
  - ✧ Catalogue record
    - ✧ describes entire experiment
  - ✧ Header record
    - ✧ describes one section of the experiment
  - ✧ Data record
    - ✧ Stores values
    - ✧ Parameters defined by CEDAR database standard
    - ✧ Contains 3 parts: Prolog, 1D records, 2D records



# Madrigal Data Records

- ✧ Prolog
  - ✧ Start and end time
  - ✧ Instrument ID
  - ✧ Kind of data ID
- ✧ 1D records (scalar)
  - ✧ Single-value parameters
- ✧ 2D records (vector)
  - ✧ Multiple-value parameters
  - ✧ All parameters must have the same number of rows (“matrix”)
  - ✧ Not meant for time variation - conflicts with Prolog!



# CEDAR/Madrigal Database

- ✧ All parameters in file defined here:

[http://cedarweb.hao.ucar.edu/documents/parameters\\_list.txt](http://cedarweb.hao.ucar.edu/documents/parameters_list.txt)

- ✧ Ranges of parameters for each instrument
- ✧ Data stored in one or two 16-bit integers
- ✧ Error parameters:
  - ✧ Mnemonics start with D
  - ✧ Code is negative of parameter code



The parameter codes list is given twice, first sorted by ascending numeric VALUE, then sorted alphabetically by abbreviation.

VALUE	DESCRIPTION	UNITS	ABBR.
-----	-----	-----	-----
(Time Related Codes:)			
9	Beginning year (universal time)	1. yr	byear
10	Year (universal time)	1. yr	year
15	Year (UT) of analysis date	1. yr	yranal
19	Beginning month/day (universal time)	1. mmdd	bmd
20	Month/day (universal time)	1. mmdd	md
21	Day number of year (universal time)	1. day	dayno
22	Model Day number of year (UT, 1=Jan 1)	1. day	mdano
25	Month/day (UT) of analysis date	1. mmdd	mdanal
28	Beginning hour/min (universal time)	1. hhmm	bhm
29	Beginning additional increment to hhmm	1.E-02 s	bhmi
30	Hour/min (universal time)	1. hhmm	hm
31	Centiseconds (UT, increment to hhmm)	1.E-02 s	hmi
34	Time past 0000 UT	1.E-03 hour	uth
36	Time past 0000 UT	1.E+01 s	uts
37	Additional increment to time past 0 UT	1.E-03 s	utsi
42	Local solar time diff (=SLT-UT) +E lon	1. hhmm	sltmult
44	Local solar time	1.E-03 hour	slt
47	Local solar time at conjugate point	1.E-03 hour	sltc
54	Magnetic local time	1.E-03 hour	Tmlt
60	Integration time for these data	1. s	inttms
61	Integration time for these data	1. min	inttmm
62	Integration time for these data	1. day	datntd
66	Time increment between rows	1. s	dtrow
70	Sampling interval (time between samples)	1. s	smptnt
72	UT of Moonset (from US Naval Obs)	1.E-03 hour	tmset
73	UT of Moonrise (from US Naval Obs)	1.E-03 hour	tmris
74	UT of Civil sunset (szen=96 deg)	1.E-03 hour	tssc
75	UT of Civil sunrise (szen=96 deg)	1.E-03 hour	tsrc
76	UT of Nautical sunset (szen=102 deg)	1.E-03 hour	tssn
77	UT of Nautical sunrise (szen=102 deg)	1.E-03 hour	tsrn
78	UT of Astronomical sunset (szen=108 deg)	1.E-03 hour	tssa



# CEDAR/Madrigal Database

- ✧ Special values
  - ✧ missing
  - ✧ assumed (error value only)
  - ✧ knownbad (error value only)
- ✧ Defined in
  - ✧ <http://download.hao.ucar.edu/archive/cedar/cedar.fmt.pdf>



# Derived Parameters

- ✦ Madrigal contains many “derived only” parameters
  - ✦ Not in CEDAR standard
- ✦ Derivation engine derives information from records
  - ✦ Time from prolog
  - ✦ Position either as 1D or 2D
  - ✦ etc
- ✦ Engine determines all parameters that can be derived



# Classes of Derived Param's

- ✦ Space, Time
  - ✦ E.g.: local time, ...
- ✦ Geophysical
  - ✦ E.g.: Kp, Dst, IMF, F10.7, SSN, ...
- ✦ Magnetic
  - ✦ E.g.: Bmag, Magn conjugate lat/long, Tsyganenko magnetic equatorial plane intercept, ...
- ✦ MSIS
  - ✦ E.g.: Tn, neutral composition



# Using Madrigal

- ✧ There are two ways to use Madrigal:
  - ✧ Web interface
  - ✧ API
    - ✧ Matlab
    - ✧ Python
    - ✧ IDL (beta stage)
  - ✧ Download here:  
<http://madrigal.haystack.mit.edu/madrigal/madDownload.html>



# Getting Data

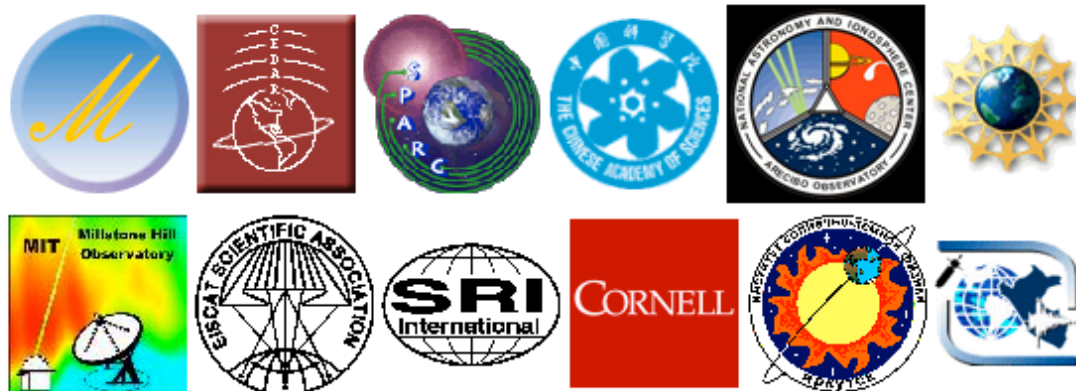


## Welcome to the Madrigal Database at EISCAT

- [Tutorial](#)
- [Access Data](#)
- [Run Models](#)
- [Documentation](#)
- [Open Madrigal](#)

Madrigal is an upper atmospheric science database used by groups throughout the world. Madrigal is a robust, World Wide Web based system capable of managing and serving archival and real-time data, in a variety of formats, from a wide range of upper atmospheric science instruments. The basic data format is the same as that used by the [National Science Foundation](#) supported Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) program, which maintains a [CEDAR Database](#) at the National Center for Atmospheric Research (NCAR). Data files are easily exchanged between the two sites, but Madrigal has a significantly different emphasis. Data at each Madrigal site is locally controlled and can be updated at any time, but shared metadata between Madrigal sites allow searching of all Madrigal sites at once.

Data can be accessed from the Madrigal sites at [Millstone Hill](#), USA, [Arecibo](#), Puerto Rico, [EISCAT](#), Norway, [SRI International](#), USA, [Cornell University](#), USA, [Jicamarca](#), Peru, [The Institute of Solar-Terrestrial Physics](#), Russia, and Wuhan Ionospheric Observatory, the Chinese Academy of Sciences. and directly, using [APIs](#) which are available for several popular programming languages. A CVS archive of all Madrigal software and documentation is available from the [Open Madrigal](#) Web site. The latest version of Madrigal may also be downloaded from there.





Back to [EISCAT homepage](#)

## Access Madrigal Data

### Simple Madrigal Data Access

This link allows you to print and plot local EISCAT Madrigal data **Individual Experiments** parameters or searching over all Madrigal servers. Click [here](#) for a tutorial.

### Browse for Individual Madrigal Experiments

Use this link to search available experiments. You can search either *all* Madrigal database. You can choose **See next slide!** g derived parameters, and can filter the data using any parameter. Click [here](#) for a tutorial.

### Global Madrigal Database Report

This link allows you to generate a report on multiple local data **Data Across Experiments** matching your criteria will be returned in a single report. Click [here](#) for a tutorial.

### Plot Data from Instruments

This link allows you to create new plots from one or more instruments **Plot Across Experiments** we [here](#) for a tutorial.

User: Thomas Ulich

Email: [thu@sgo.fi](mailto:thu@sgo.fi)

Affiliation: SGO

[Click here to modify](#)

*Use of the Madrigal Database is generally subject to the [CEDAR Database Rules-of-the-Road](#). Prior permission to access the data is not required. However, the user is required to establish early contact with any organization whose data are involved in the project to discuss the intended usage. Data are often subject to limitations which are not immediately evident to new users. Before they are formally submitted, draft copies of all reports and publications must be sent to the contact scientist at all data-*



Madrigal Inventory

http://www.eiscat.se/madrigal/cgi-bin/madInvent.cgi

Google

Madrigal Inventory

# Madrigal global experiment selector

Return to [Madrigal homepage](#)

[Tutorial](#) on this page

Return to [access data](#) page

## Select instrument(s)

Choose what instrument type(s) to select from:

All Instrument Types

Incoherent Scatter Radars

Geophysical Indices

Modelled data

MST Radars

MF Radars

Choose one or more instrument types

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

Chatanika IS Radar [1979–1979]

ISTP Irkutsk Radar [1995–2002]

Poker Flat IS Radar [2007–2010]

EISCAT combined IS Radars [1986–2005]

EISCAT Kiruna UHF IS Receiver [1984–2010]

EISCAT Tromso UHF IS radar [1984–2010]

EISCAT Sodankyla UHF IS Receiver [1984–2010]

EISCAT Tromso VHF IS radar [1990–2010]

Sondrestrom IS Radar [1983–2009]

EISCAT Svalbard IS Radar Longyearbyen [1997–2009]

Choose one or more instruments

## Show Experiments at

☒ All Madrigal Sites

☐ This Madrigal Site (EISCAT)

Default is to search all sites

## File Selection

☒ Show Default Files

☐ Show All Files

## Select date range

1

1

2009

Start Day, Month, Year

31

12

2009

End Day, Month, Year

List selected experiments

Give time interval of interest



# Madrigal global experiment selector

[Return to Madrigal homepage](#)
[Tutorial](#) on this page

[Return to access data page](#)

	Site	Exp start		Exp end		Instrument name		Inst Id	Exp name
	----	-----		-----		-----		-----	-----
<a href="#">GO</a>	EISCA	2009-01-16	09:34:23	2009-01-16	09:35:59	EISCAT	Svalbard IS R	95	beata_60
<a href="#">GO</a>	EISCA	2009-01-17	05:01:35	2009-01-17	11:58:23	EISCAT	Svalbard IS R	95	beata_120
<a href="#">GO</a>	EISCA	2009-01-18	04:00:39	2009-01-18	11:59:09	EISCAT	Svalbard IS R	95	islopes_60
<a href="#">GO</a>	EISCA	2009-01-19	04:00:35	2009-01-19	11:31:53	EISCAT	Svalbard IS R	95	beata_90
<a href="#">GO</a>	EISCA	2009-01-20	04:00:09	2009-01-20	11:59:04	EISCAT	Svalbard IS R	95	islopes_60
<a href="#">GO</a>	EISCA	2009-01-22	04:00:34	2009-01-23	00:00:29	EISCAT	Svalbard IS R	95	islopes_60
<a href="#">GO</a>	EISCA	2009-01-23				EISCAT	Svalbard IS R	95	ipy_60
<a href="#">GO</a>	EISCA	2009-01-24				EISCAT	Svalbard IS R	95	islopes_60
<a href="#">GO</a>	EISCA	2009-01-25				EISCAT	Svalbard IS R	95	beata_90
<a href="#">GO</a>	EISCA	2009-01-26				EISCAT	Svalbard IS R	95	islopes_60
<a href="#">GO</a>	EISCA	2009-01-27	04:02:54	2009-01-27	10:00:18	EISCAT	Svalbard IS R	95	beata_90
<a href="#">GO</a>	EISCA	2009-01-28	04:00:19	2009-01-28	10:59:29	EISCAT	Svalbard IS R	95	islopes_60
<a href="#">GO</a>	EISCA	2009-02-04	08:00:29	2009-02-05	00:00:59	EISCAT	Svalbard IS R	95	beata_60
<a href="#">GO</a>	EISCA	2009-02-05	00:00:59	2009-02-06	00:00:59	EISCAT	Svalbard IS R	95	beata_60
<a href="#">GO</a>	EISCA	2009-02-06	00:00:59	2009-02-06	13:59:29	EISCAT	Svalbard IS R	95	beata_60
<a href="#">GO</a>	EISCA	2009-02-18	19:02:29	2009-02-19	00:01:53	EISCAT	Svalbard IS R	95	steffe_120
<a href="#">GO</a>	EISCA	2009-02-19	00:00:05	2009-02-20	00:00:59	EISCAT	Svalbard IS R	95	ipy_60
<a href="#">GO</a>	EISCA	2009-02-20	00:00:59	2009-02-20	18:59:29	EISCAT	Svalbard IS R	95	ipy_60
<a href="#">GO</a>	EISCA	2009-02-23	09:24:48	2009-02-23	11:59:56	EISCAT	Svalbard IS R	95	manda_60
<a href="#">GO</a>	EISCA	2009-02-26	19:01:11	2009-02-27	00:01:53	EISCAT	Svalbard IS R	95	steffe_120
<a href="#">GO</a>	EISCA	2009-02-27	00:00:05	2009-02-27	11:58:35	EISCAT	Svalbard IS R	95	steffe_120
<a href="#">GO</a>	EISCA	2009-03-14	18:59:59	2009-03-15	00:00:59	EISCAT	Svalbard IS R	95	steffe_60
<a href="#">GO</a>	EISCA	2009-03-15	00:00:11	2009-03-15	11:59:29	EISCAT	Svalbard IS R	95	steffe_60
<a href="#">GO</a>	EISCA	2009-03-17	09:20:04	2009-03-17	11:00:00	EISCAT	Svalbard IS R	95	manda_60
<a href="#">GO</a>	EISCA	2009-03-19	08:02:48	2009-03-19	11:59:12	EISCAT	Svalbard IS R	95	steffe_60
<a href="#">GO</a>	EISCA	2009-03-22	19:00:41	2009-03-23	00:00:59	EISCAT	Svalbard IS R	95	steffe_120
<a href="#">GO</a>	EISCA	2009-03-23	00:00:05	2009-03-23	11:59:29	EISCAT	Svalbard IS R	95	steffe_120
<a href="#">GO</a>	EISCA	2009-03-24	12:26:11	2009-03-25	00:00:29	EISCAT	Svalbard IS R	95	beata_ant
<a href="#">GO</a>	EISCA	2009-03-25	00:00:29	2009-03-26	00:00:00	EISCAT	Svalbard IS R	95	beata_ant
<a href="#">GO</a>	EISCA	2009-03-26	00:00:00	2009-03-26	13:59:59	EISCAT	Svalbard IS R	95	beata_ant

Let's try this!



# EISCAT Svalbard IS Radar Longyearbyen

ipy\_60

[Return to Madrigal homepage](#)

[Tutorial](#) on this page

[Return to access data page](#)

Start Time: 02/20/2009 00:00:59 End Time: 02/20/2009 18:59:29

## CEDAR Format Datasets:

- NCAR\_2009-02-20\_ipy\_60\_42m.bin - default file for GUISDAP Fitted Parameters - status: Final
  - [Print file as ascii \(isprint\)](#) - Choose parameters (and optional filters) to print - *standard method to access data*
    - [One-step file print](#) - Click to print entire file in one step using parameters in file (no derived parameters or filters)
  - [Print individual records](#) - Lists individual records, allows printing each record separately
  - [Download file](#) - Download NCAR\_2009-02-20\_ipy\_60\_42m.bin in selected Ascii or Cedar format

No link here, so no catalogue or header records.

## Additional information:

isprint - browse measured and derived parameters with filtering.

Scroll Down!

These data are the intellectual property of the EISCAT Scientific Association. Except where clearly noted as Common Programme (CP), use of these data is restricted to the original experimenter (as noted in the description file available through the schedule system at [www.eiscat.se/schedule/schedule.cgi](http://www.eiscat.se/schedule/schedule.cgi)) for one year from the date of the experiment. Otherwise, these data may be used freely for the purpose of illustration for teaching and for non-commercial scientific research, provided that the source is acknowledged and to the extent justified by the non-commercial purpose to be achieved. Substantial use of these data should be discussed at an early stage with knowledgeable scientists within the EISCAT Scientific Association in order to clarify matters of use, calibration and potential co-authorship. Ingemar Haggstrom, at EISCAT Headquarters, can provide advice on suitable contacts. Any further distribution of these data, including installation in any database, must be accompanied by this statement and subject to the same conditions of use.



Start Time: 02/20/2009 00:00:59 End Time: 02/20/2009 18:59:29

#### CEDAR Format Datasets:

- NCAR\_2009-02-20\_ipy\_60\_42m.bin - default file for GUIDAP Fitted Parameters - status: Final
  - [Print file as ascii \(isprint\)](#) - Choose parameters (and optional filters) to print - *standard method to access data*
    - [One-step file print](#) - Click to print entire file in one step using parameters in file (no derived parameters or filters)
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IMAGES
<a href="#">2009-02-20_ipy_60_42m.pdf</a> <a href="#">.png</a> <a href="#">.jpg</a> <a href="#">.jpeg</a>



#### Notes

[Add to these notes](#) Notes can be added to every experiment.





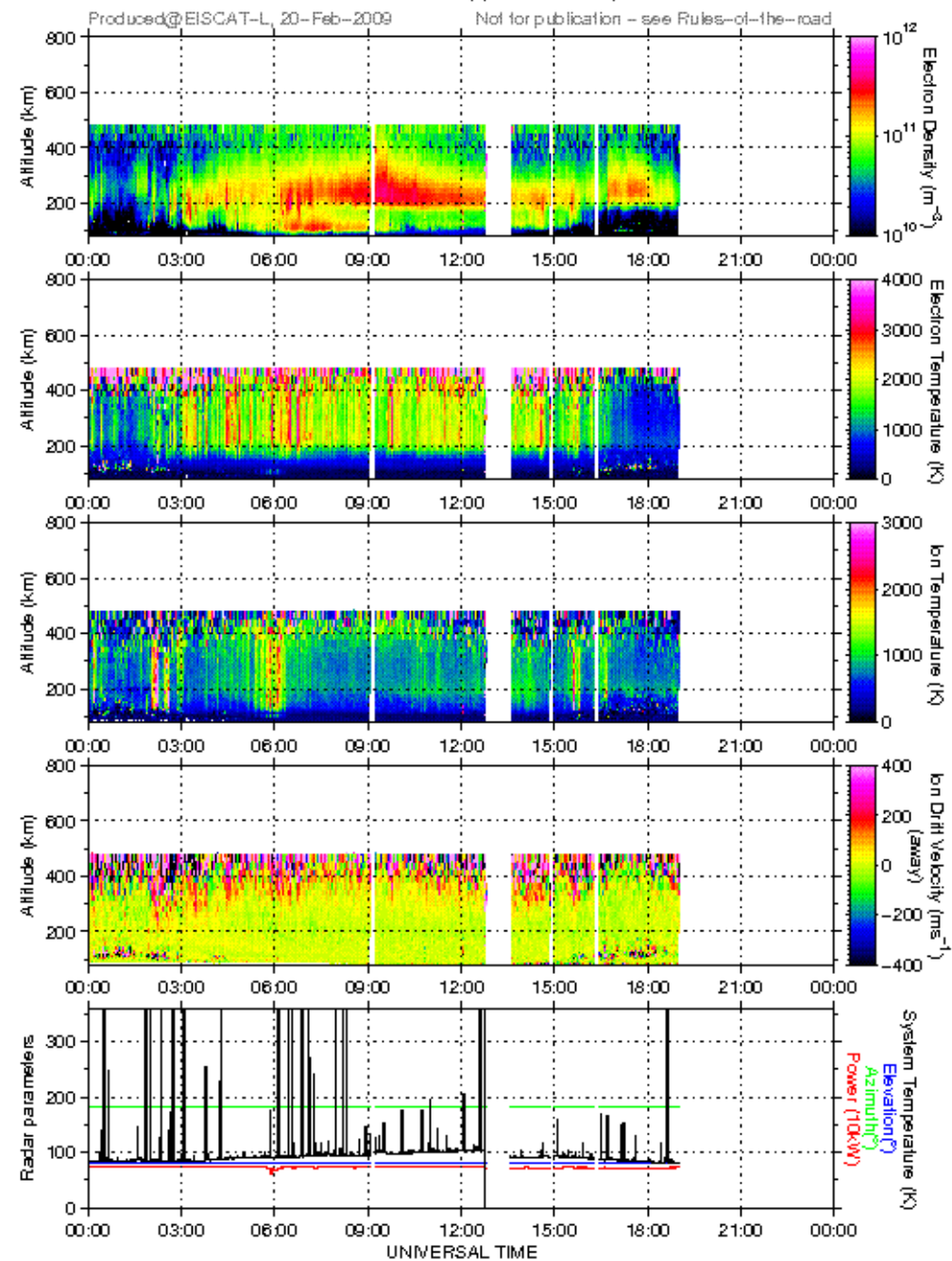
# EISCAT Scientific Association

## EISCAT SVALBARD RADAR

IPY, 42m, ipy, 20 February 2009

Produced@EISCAT-L, 20-Feb-2009

Not for publication - see Rules-of-the-road





isprint





## Print file as ascii (isprint)

**Experiment:** ipy\_60   **File:** NCAR\_2009-02-20\_ipy\_60\_42m.bin   **Type of data:** GUISDAP Fitted Parameters

[Return to experiment list](#)[Return to Madrigal homepage](#)[A tutorial](#) on how to use this page[Return to access data page](#)

### Instructions

1. If you want to filter the data, use the first section: *Available Filters*. Skip the filter section to get all data.
2. In the next section (*Available Parameters*), select the parameters you want to print. The parameters printed in bold are the ones in this file, while the others are derived from those parameters. Click on the parameter to see its definition.
3. At the bottom are some optional output formatting options.
4. Click *Display Data*.

2009-02-20 00:00:59 - 2009-02-20 18:59:29 : EISCAT Svalbard IS Radar Longyearbyen

### Available Filters - Using default or manually entered selections

#### Set data filters manually, or ...

- Data will be listed only if it falls within the range of the filter
- For azimuth and elevation, two separate ranges can now be used
- [Explanation of Filters](#)

Start date: Feb 20 2009

Start time: H: 0 M: 0 S: 59

#### ...use a saved filter and parameter selection:

Saved filters:



New version of isprint on the web! (Comprehensive)

http://www.eiscat.se/madrigal/cgi-bin/madDataBrowse?fileName=/opt/madrig

New version of isprint on the web...

### Set data filters manually, or ...

- Data will be listed only if it falls within the range of the filter
- For azimuth and elevation, two separate ranges can now be used
- [Explanation of Filters](#)

Start date: Feb 20 2009

Start time: H: 0 M: 0 S: 59

End date: Feb 20 2009

End time: H: 18 M: 59 S: 29

*Note: Not all records can derive alt. Setting any alt limits will filter out those records.*

Min altitude: Max altitude:

*Note: Az from -180 to 180. Az range is clockwise, so if (eg.):  
[lower az, upper az] = [170, -170], range goes through 180 degrees.*

Min azimuth: -180.0 Max azimuth: 180.0

Min elevation: 0.0 Max elevation: 90.0

Additional az, el ranges (Data is included if in either range)

Min azimuth 2: 0.0 Max azimuth 2: 0.0

Min elevation 2: 0.0 Max elevation 2: 0.0

Select kindat: all

Optional free-form filters using any parameter mnemonic on this page

Mnemonic (or Mnem1 +,-,*/ Mnem2) (example: gdalt or gdalt - sdwht) Leave spaces between mnemonics and operator	Lower limit (leave blank if none)	Upper limit (leave blank if none)

### ...use a saved filter and parameter selection:

Saved filters:

You can define filters and select them with one click!



New version of isprint on the web! (Comprehensive)

http://www.eiscat.se/madrigal/cgi-bin/madDataBrowse?fileName=/opt/madrig

New version of isprint on the web...

- [Explanation of Filters](#)

Start date: Feb 20 2009

Start time: H: 0 M: 0 S: 59

End date: Feb 20 2009

End time: H: 18 M: 59 S: 29

*Note: Not all records can derive alt. Setting any alt limits will filter out those records.*

Min altitude: Max altitude:

*Note: Az from -180 to 180. Az range is clockwise, so if (eg.):  
[lower az, upper az] = [170, -170], range goes through 180 degrees.*

Min azimuth: -180.0 Max azimuth: 180.0

Min elevation: 0.0 Max elevation: 90.0

*Additional az, el ranges (Data is included if in either range)*

Min azimuth 2: 0.0 Max azimuth 2: 0.0

Min elevation 2: 0.0 Max elevation 2: 0.0

Select kindat: all

*Optional free-form filters using any parameter mnemonic on this page*

Mnemonic (or Mnem1 +,-,*/ Mnem2) (example: gdalt or gdalt - sdwht) Leave spaces between mnemonics and operator	Lower limit (leave blank if none)	Upper limit (leave blank if none)
nel - dnel	1.0	

Saved filters:

Enter a free-form filter using mnemonics:  
Nel -DNel > 1

Open "http://www.eiscat.se/madrigal/wt\_dataBrowser.html#filter" in a new tab



## Available Parameters (Comprehensive)

- Description of parameters
- ISPrint(Short form)

- Measured parameters in **bold font**.
- Derived parameters in normal font.
- Click on any parameter for full description.

(parameters with regular typeface are derived)

### Time Related Parameter

- |  |                                       |  |   |   |
|--|---------------------------------------|--|---|---|
| <input type="checkbox"/> <u>APLT</u>   | <input type="checkbox"/> <u>BDAY</u>  | <input type="checkbox"/> <u>BEG UT</u>         | <input type="checkbox"/> <u>BHHMMSS</u>       | <input type="checkbox"/> <u>BHM</u>         |
| <input type="checkbox"/> <u>BMONTH</u> | <input type="checkbox"/> <u>B_UTH</u> | <input type="checkbox"/>                       | <input type="checkbox"/>                      | <input type="checkbox"/> <u>DAY</u>         |
| <input type="checkbox"/> <u>DAYNO</u>  | <input type="checkbox"/> <u>DUT21</u> | <input type="checkbox"/> <u>CONJ SUNRISE H</u> | <input type="checkbox"/> <u>CONJ SUNSET H</u> | <input type="checkbox"/> <u>DAY</u>         |
| <input type="checkbox"/> <u>JDAYNO</u> | <input type="checkbox"/> <u>MD</u>    | <input type="checkbox"/> <u>EHMMSS</u>         | <input type="checkbox"/> <u>FYEAR</u>         | <input type="checkbox"/> <u>HOURL</u>       |
| <input type="checkbox"/> <u>SEC</u>    | <input type="checkbox"/> <u>SLT</u>   | <input type="checkbox"/> <u>MIN</u>            | <input type="checkbox"/> <u>MONTH</u>         | <input type="checkbox"/> <u>RECNO</u>       |
| <input type="checkbox"/> <u>UT</u>     | <input type="checkbox"/> <u>UT1</u>   | <input type="checkbox"/> <u>SLTC</u>           | <input type="checkbox"/> <u>SUNRISE HOUR</u>  | <input type="checkbox"/> <u>SUNSET HOUR</u> |
|  |                                       | <input type="checkbox"/> <u>UT2</u>            | <input type="checkbox"/> <u>UTH</u>           | <input type="checkbox"/> <u>YEAR</u>        |

### Geographic Coordinate

- |                                     |                                       |                                       |                                       |                                       |
|-------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> <u>AZM</u> | <input type="checkbox"/> <u>ELM</u>   | <input type="checkbox"/> <u>GDALT</u> | <input type="checkbox"/> <u>GDLAT</u> | <input type="checkbox"/> <u>GLON</u>  |
| <input type="checkbox"/> <u>HSA</u> | <input type="checkbox"/> <u>RANGE</u> | <input type="checkbox"/> <u>SDWHT</u> | <input type="checkbox"/> <u>SZEN</u>  | <input type="checkbox"/> <u>SZENC</u> |

### Magnetic Coordinate

- |  |  |   |                                    |   |
|--|--|---|------------------------------------|---|
| <input type="checkbox"/> <u>APLAT</u>    | <input type="checkbox"/> <u>APLON</u>  | <input type="checkbox"/> <u>ASPECT</u>      | <input type="checkbox"/> <u>BD</u> | <input type="checkbox"/> <u>BDEC</u>    |
| <input type="checkbox"/> <u>BE</u>       | <input type="checkbox"/> <u>BINC</u>   | <input type="checkbox"/> <u>BMAG</u>        | <input type="checkbox"/> <u>BN</u> | <input type="checkbox"/> <u>CGM LAT</u> |
| <input type="checkbox"/> <u>CGM LONG</u> | <input type="checkbox"/> <u>DIPLAT</u> | <input type="checkbox"/> <u>E REG N LAT</u> | <input type="checkbox"/>           | <input type="checkbox"/>                |



New version of isprint on the web! (Comprehensive)

http://www.eiscat.se/madrigal/cgi-bin/madDataBrowse?fileName=/opt/madrig

New version of isprint on the web...

☐ [NN4SL](#) ☐ [NO2L](#) ☐ [NOL](#) ☐ [TINFM](#) ☐ [TN](#)

☐ [TNM](#)

**Unit Vector Definition**

☐ [CXR](#) ☐ [CYR](#) ☐ [CZR](#)

**Conductivity**

☐ [HLCON](#) ☐ [DHLCON](#) ☐ [PDCON](#) ☐ [DPDCON](#)

**I. S. Radar Operation Parameter**

☐ [FOF2](#)

**Prolog Parameters**

☐ [KINDAT](#) ☐ [KINST](#)

---

**Output format**

- [Explanation of output formatting](#)

☐ Headers off    Unknown value string:     Max characters per row (50-9999):

---

Please send any comments or suggestions to the [Open Madrigal Users Mailing List](#).



Display Madrigal Data

http://www.eiscat.se/madrigal/cgi-bin/madDataDisplay

Display Madrigal Data

## Isprint output

Please contact [EISCAT](#) before using this data in a report or publication.

[Return to Isprint](#) [List text only](#) [Save text to file](#)

Data derived from file /opt/madrigal/experiments/2009/1yr/20feb09/NCAR\_2009-02-20\_ipy\_60\_42m.bin:  
Filters used:  
Filter 1:  
UT1  
Range 1: Lower = 1866240059.0 (02/20/2009 0000:59), upper = 1866308369.0 (02/20/2009 1859:29)  
Filter 2:  
NEL - DNEL  
Range 1: Lower = 1, no upper limit

EISCAT Svalbard IS Radar Longyearbyen: 02/20/2009 0000:59-0001:59

UT	RANGE	NEL	DNEL
0.025	97.83	9.485	8.439
0.025	109.96	9.586	8.518
0.025	134.50	10.158	8.908
0.025	142.99	10.306	8.868
0.025	152.32	10.365	8.909
0.025	162.86	10.445	8.923
0.025	174.68	10.486	8.971
0.025	187.01	10.613	9.062
0.025	200.53	10.607	9.095
0.025	215.21	10.646	9.167
0.025	230.96	10.707	9.185
0.025	248.09	10.774	9.249
0.025	265.18	10.706	9.252
0.025	284.05	10.702	9.294
0.025	303.76	10.571	9.285
0.025	324.39	10.490	9.307

Here: headers were on.



# Global Search



Madrigal Database Access

http://www.eiscat.se/madrigal/cgi-bin/accessData.cgi

Google

Madrigal Database Access

Back to [EISCAT homepage](#)

Access Madrigal Data

Go to a different Madrigal site:

### [Simple Madrigal Data Access](#)

This link allows you to print and plot local EISCAT Madrigal data easily. Use the other three Madrigal interfaces to access more powerful capabilities, such as displaying derived parameters or searching over all Madrigal servers. Click [here](#) for a tutorial.

### [Browse for Individual Madrigal Experiments](#)

Use this link to search available experiments. You can search either *all* Madrigal databases, or just the local EISCAT database. You can choose which parameters to print, including derived parameters, and can filter the data using any parameter. Click [here](#) for a tutorial.

### [Global Madrigal Database Report](#)

This link allows you to generate a report on multiple local EISCAT experiments at once. Experiments can be filtered in a number of ways. Data from the local Madrigal database matching your criteria will be returned in a single report. Click [here](#) for a tutorial.

### [Plot Data from Instruments](#)

This link allows you to create new plots from one or more instruments and/or Madrigal experiments versus time on a single web page. The data comes from the local EISCAT database. Click [here](#) for a tutorial.

User: Thomas Ulich	Email: <a href="mailto:thu@sgo.fi">thu@sgo.fi</a>	Affiliation: SGO	<a href="#">Click here to modify</a>
--------------------	---	------------------	--------------------------------------

*Use of the Madrigal Database is generally subject to the [CEDAR Database Rules-of-the-Road](#). Prior permission to access the data is not required. However, the user is required to establish early contact with any organization whose data are involved in the project to discuss the intended usage. Data are often subject to limitations which are not immediately evident to new users. Before they are formally submitted, draft copies of all reports and publications must be sent to the contact scientist at all data-*



Madrigal Global Search

http://www.eiscat.se/madrigal/cgi-bin/madSearch?callingpage=madSearch&kin Google

Madrigal Global Search

## EISCAT Madrigal database global search

Return to [Madrigal homepage](#)

Tutorial on this page

Return to [access data](#) page

This page allows you to search the entire local EISCAT Madrigal database at once. The amount of data you can request may be limited by server capacity. Download the script [globalsprint.py](#) to run an unlimited search from your local computer.

**Select instrument(s)**

EISCAT combined IS Radars 1986–2005  
EISCAT Kiruna UHF IS Receiver 1984–2010  
EISCAT Tromso UHF IS radar 1984–2010  
EISCAT Sodankyla UHF IS Receiver 1984–2010  
EISCAT Tromso VHF IS radar 1990–2010  
EISCAT Svalbard IS Radar Longyearbyen 1997–2009  
Interplanetary Mag Field and Solar Wind 1963–2010  
Geophysical Indices 1950–2010

**Select date range**

Start dd/mm/yyyy

111950

End dd/mm/yyyy

31122010

☐ Show advanced filters (kind of data, seasonal dates, experiment names, parameter filters)

☐ Show individual filenames in report.

Select parameter(s) to display

Clear

Continue

---

Please send any comments or suggestions to the [Open Madrigal Users Mailing List](#).



Madrigal Global Search

http://www.eiscat.se/madrigal/cgi-bin/madSearch?callingpage=madParmList&s Google

Madrigal Global Search

## EISCAT Madrigal database global search

Return to [Madrigal homepage](#)

[Tutorial](#) on this page

Return to [access data](#) page

This page allows you to search the entire local EISCAT Madrigal database at once. The amount of data you can request may be limited by server capacity. Download the script [globalIsprint.py](#) to run an unlimited search from your local computer.

### Select instrument(s)

EISCAT combined IS Radars 1986–2005  
EISCAT Kiruna UHF IS Receiver 1984–2010  
EISCAT Tromso UHF IS radar 1984–2010  
EISCAT Sodankyla UHF IS Receiver 1984–2010  
EISCAT Tromso VHF IS radar 1990–2010  
EISCAT Svalbard IS Radar Longyearbyen 1997–2009  
Interplanetary Mag Field and Solar Wind 1963–2010  
Geophysical Indices 1950–2010

### Select date range

Start dd/mm/yyyy 

1

1

1990

End dd/mm/yyyy 

31

12

2010

### Select kinds of data

CP-2-B  
CP-2-C  
CP-2-D  
CP-2-E  
CP-3-C  
CP-3-E  
CP-3-F  
CP-3-G

### Select seasonal filter

Start dd/mm 

1

1

End dd/mm 

31

12

Enter complete or partial experiment name: *Leave blank to accept all experiment names.*



Madrigal Global Search

http://www.eiscat.se/madrigal/cgi-bin/madSearch?callingpage=madParmList&s

Google

CP-3-G

**Enter complete or partial experiment name:** *Leave blank to accept all experiment names.*

Set up filters using any [Madrigal parameter\(s\)](#)

Mnemonic (or Mnem1 +,-,\* / Mnem2)  
(example: gdalt or gdalt - sdwht)  
Leave spaces between mnemonics and operator

	Lower limit (leave blank if none)	Upper limit (leave blank if none)

☒ Show advanced filters (kind of data, seasonal dates, experiment names, parameter filters)

☐ Show individual filenames in report.

Select parameter(s) to display

Parameters you selected so far: [UT](#) [AZM](#) [ELM](#)  
[NEL](#) [DNEL](#)

Clear Continue

Please send any comments or suggestions to the [Open Madrigal Users Mailing List](#).



Get Email

← →

+

http://www.eiscat.se/madrigal/cgi-bin/GetEmailFromUser?callingpage=madSea

Q Google

Get Email

# The following is a summary of your requested query:

**Instruments:** EISCAT Sodankyla UHF IS Receiver  
**Kinds of Data:** CP-3-G  
**Experiment Name:** All experiment names accepted  
**StartDate** = 1/1/1990  
**EndDate** = 31/12/2010  
**Seasonal filter** = 1/1 - 31/12 (no seasonal filter)  
**Data filters:**  
No filters entered

**Parameters displayed:** UT, AZM, ELM, NEL, DNEL

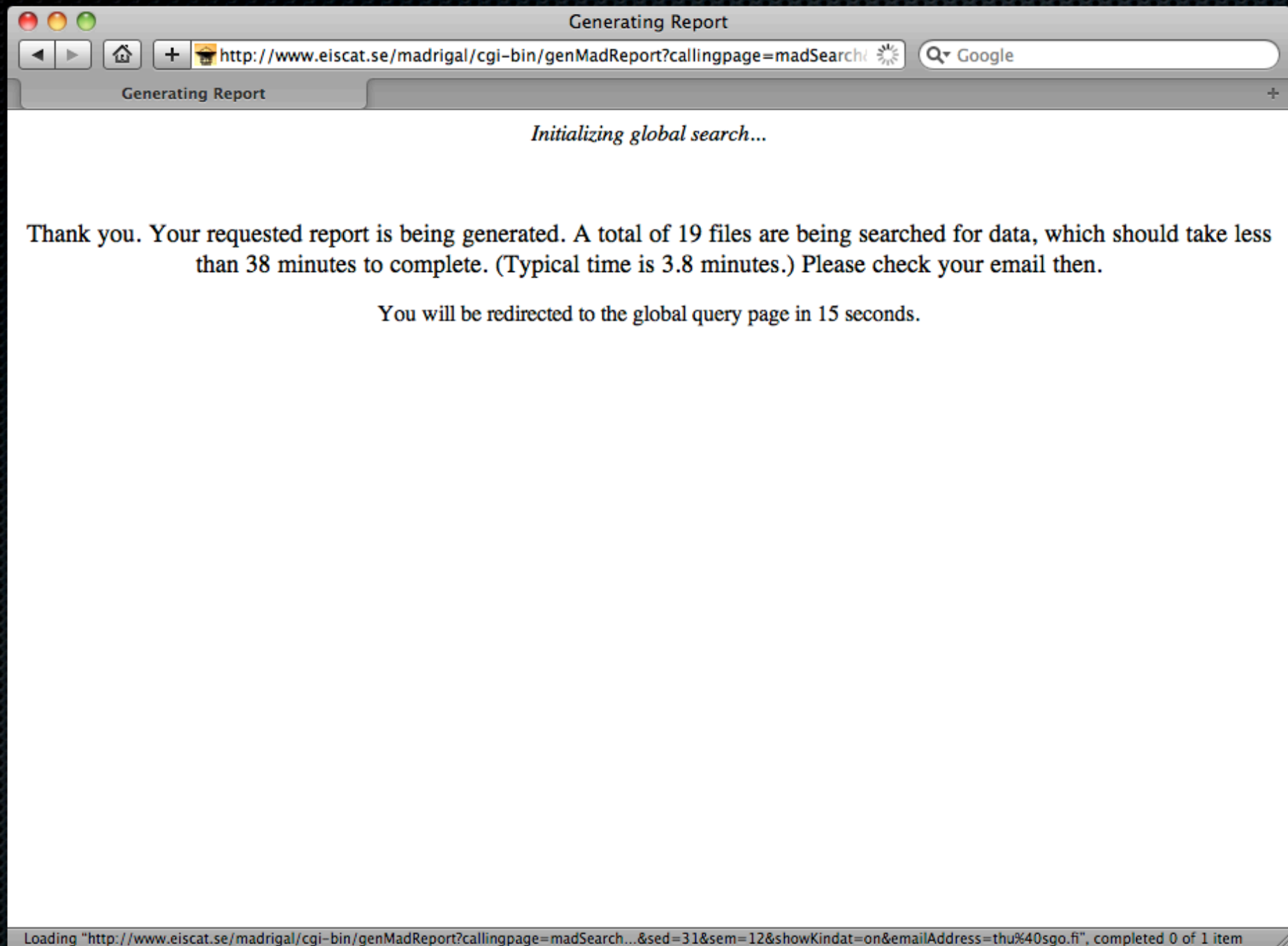
Hit cancel to modify your query.

Please enter your email address below and your requested report would be sent to your mail box. After you hit OK, an estimate of the time needed to run your query will be displayed, and then you will be returned to the main global search page.

thu@sgo.fi

CancelOK







ALPINE 2.00 MESSAGE TEXT <Incoming-Folders> No Rule Msg 3 of 3 72% NEW +

Date: Sun, 29 Aug 2010 11:48:40 +0200 (CEST)  
From: Background\_Madrigal\_Query@mh.eiscat.se  
To: thu@sgo.fi  
Subject: Madrigal Global Query on 29 Aug 2010: Success

The report you requested is now available at the following url:  
<http://www.eiscat.se/madrigal/tempReports/mad1297893.txt>

It will be available for at least 10 days.

This report was generated using the following criteria:

Report requested from the Madrigal Database Search Query by thu@sgo.fi  
8/29/2010

Instruments:  
EISCAT Sodankyla UHF IS Receiver

Kinds of Data:  
CP-3-G

Experiment Name:  
None

StartDate = 1/1/1990  
EndDate = 31/12/2010  
Yearly filter = 1/1 - 31/12

Data filters:  
Parameters displayed: ['UT', 'AZM', 'ELM', 'NEL', 'DNEL']

Local rules of the road for data access:  
These data are the intellectual property of the EISCAT  
Scientific Association. Except where clearly noted as Common  
Programme (CP), use of these data is restricted to the  
original experimenter (as noted in the description file  
available through the schedule system at

? Help < MsgIndex P PrevMsg - PrevPage D Delete R Reply  
O OTHER CMDS > ViewAttch N NextMsg Spc NextPage U Undelete F Forward



http://www.eiscat.se/madrigal/tempReports/mad1297893.txt

Madrigal Global Search

Global search results  
Report requested from the Madrigal Database Search Query by thu@sgo.fi  
8/29/2010  
Instruments:  
    EISCAT Sodankyla UHF IS Receiver  
Kinds of Data:  
    CP-3-G  
Experiment Name:  
    None  
StartDate = 1/1/1990  
EndDate = 31/12/2010  
Yearly filter = 1/1 - 31/12  
Data filters:  
Parameters displayed: ['UT', 'AZM', 'ELM', 'NEL', 'DNEL']

/opt/madrigal/experiments/1993/sod/17mar93/03171600.sra:  
    Experiment start: Mon Mar 17 16:00:00 1993  
    Experiment end: Mon Mar 18 00:02:00 1993  
    Instrument name: EISCAT Sodankyla UHF IS Receiver  
    Experiment name: cp\_3\_g  
    Kind of data: CP-3-G

Data derived from file /opt/madrigal/experiments/1993/sod/17mar93/03171600.sra:  
Filters used:

UT	AZM	ELM	NEL	DNEL
16.019	207.50	30.60	missing	missing
16.043	216.20	35.80	missing	missing
16.076	228.60	41.10	11.558	9.869
16.101	245.70	45.20	11.540	9.775
16.129	265.90	46.30	11.511	9.859
16.160	284.70	43.80	11.508	9.765
16.192	297.20	40.30	11.428	9.822
16.217	306.30	36.30	11.412	9.820
16.244	312.70	32.69	11.321	9.701
16.279	320.09	27.70	11.256	9.736
16.306	324.90	23.80	11.315	9.727



# Plotting Data



Madrigal Database Access

http://www.eiscat.se/madrigal/cgi-bin/accessData.cgi

Google

Madrigal Database Access

[Back to EISCAT homepage](#)

# Access Madrigal Data

Go to a different Madrigal site:

EISCAT

## Simple Madrigal Data Access

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## Plot Data from Instruments

This link allows you to create new plots from one or more instruments and/or Madrigal experiments versus time on a single web page. The data comes from the local EISCAT database. Click [here](#) for a tutorial.

User: Thomas Ulich

Email: thu@sgo.fi

Affiliation: SGO

[Click here to modify](#)

*Use of the Madrigal Database is generally subject to the [CEDAR Database Rules-of-the-Road](#). Prior permission to access the data is not required. However, the user is required to establish early contact with any organization whose data are involved in the project to discuss the intended usage. Data are often subject to limitations which are not immediately evident to new users. Before they are formally submitted, draft copies of all reports and publications must be sent to the contact scientist at all data-*



Select instruments to plot

http://www.eiscat.se/madrigal/cgi-bin/plotInstrumentsSelect.py

Google

Select instruments to plot

## Add new plot(s)

This page allows you to add plots to make a collection of stacked plots, all with the same time scale. If you want to add a series of plots with the same parameters from more than one instrument, just select more than one instrument. If you want to stack plots with different parameters, just add one plot at a time. Each time you add a new plot, you will have the chance to view the ones you have created, and either add more, or start over.

[Return to main Madrigal page](#)[Tutorial](#) on this page

### Select instrument(s)

EISCAT combined IS Radars 1986–2005

EISCAT Kiruna UHF IS Receiver 1984–2010

EISCAT Tromso UHF IS radar 1984–2010

EISCAT Sodankyla UHF IS Receiver 1984–2010

EISCAT Tromso VHF IS radar 1990–2010

EISCAT Svalbard IS Radar Longyearbyen 1997–2009

Interplanetary Mag Field and Solar Wind 1963–2010

Geophysical Indices 1950–2010

DST Index 1957–2007

SOUSY Svalbard MST Radar Longyearbyen 2001–2001

### Select time period


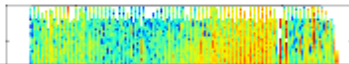
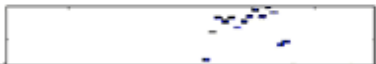
Show ALL times data available for these instruments

Select time range to plot data:

Start:	Year	2010	Month	8	Day	29
	Hour	0	Min	0	Sec	0
End	Year	2010	Month	8	Day	29
	Hour	23	Min	59	Sec	59

☒ Scatter plot

☐ Pcolor plot





Select instruments to plot

←

→

⌂

+

🌐

http://www.eiscat.se/madrigal/cgi-bin/plotInstrumentsSelect.py

↻

🔍 Google

Select instruments to plot

EISCAT combined IS Radars 1986–2005

EISCAT Kiruna UHF IS Receiver 1984–2010

EISCAT Tromso UHF IS radar 1984–2010

EISCAT Sodankyla UHF IS Receiver 1984–2010

EISCAT Tromso VHF IS radar 1990–2010

EISCAT Svalbard IS Radar Longyearbyen 1997–2009

Interplanetary Mag Field and Solar Wind 1963–2010

Geophysical Indices 1950–2010

DST Index 1957–2007

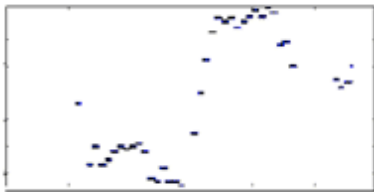
SOUSY Svalbard MST Radar Longyearbyen 2001–2001

Show ALL times data available for these instruments

Select time range to plot data:

Start:	Year	2010	Month	1	Day	29
	Hour	0	Min	0	Sec	0
End	Year	2010	Month	1	Day	29
	Hour	23	Min	59	Sec	59

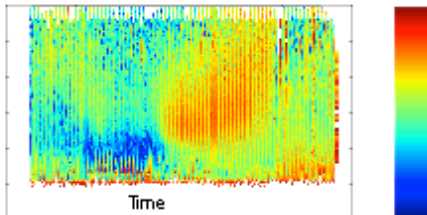
☐ Scatter plot



Time

Use a scatter plot to plot a single parameter versus time.

☒ Pcolor plot



Time

Use a pcolor plot to plot altitude versus time for a given parameter.

Clear

Choose parameter to plot

←

Please send any comments or suggestions to the [Open Madrigal Users Mailing List](#).



Choose parameter to plot

http://www.eiscat.se/madrigal/cgi-bin/plotParametersSelect.py?callingpage=pl

Choose parameter to plot

# Choose a single parameter to plot for the selected instruments

The parameter you choose will be plotted as a pcolor plot versus altitude and the time period you selected.

Click on any parameter name to see a full description.

## I. S. Radar Basic Parameter

<input type="radio"/> <a href="#">CO</a>	<input type="radio"/> <a href="#">COL</a>	<input type="radio"/> <a href="#">DCOL</a>	<input type="radio"/> <a href="#">NE</a>	<input type="radio"/> <a href="#">DNE</a>
<input checked="" type="radio"/> <a href="#">NEL</a>	<input type="radio"/> <a href="#">DNEL</a>	<input type="radio"/> <a href="#">NEL MODEL</a>	<input type="radio"/> <a href="#">NEL_MODELDIFF</a>	<input type="radio"/> <a href="#">NE MODEL</a>
<input type="radio"/> <a href="#">NE_MODELDIFF</a>	<input type="radio"/> <a href="#">PO+</a>	<input type="radio"/> <a href="#">POP</a>	<input type="radio"/> <a href="#">POPL</a>	<input type="radio"/> <a href="#">TE</a>
<input type="radio"/> <a href="#">DTE</a>	<input type="radio"/> <a href="#">TE MODEL</a>	<input type="radio"/> <a href="#">TE_MODELDIFF</a>	<input type="radio"/> <a href="#">TI</a>	<input type="radio"/> <a href="#">DTI</a>
<input type="radio"/> <a href="#">TI MODEL</a>	<input type="radio"/> <a href="#">TI_MODELDIFF</a>	<input type="radio"/> <a href="#">TR</a>	<input type="radio"/> <a href="#">DTR</a>	<input type="radio"/> <a href="#">VO</a>
<input type="radio"/> <a href="#">DVO</a>	<input type="radio"/> <a href="#">VO MODEL</a>	<input type="radio"/> <a href="#">VO_MODELDIFF</a>		

## IRI Model

<input type="radio"/> <a href="#">NEL_IRI</a>	<input type="radio"/> <a href="#">NE_IRI</a>	<input type="radio"/> <a href="#">PH+_IRI</a>	<input type="radio"/> <a href="#">PHE+_IRI</a>	<input type="radio"/> <a href="#">PN+_IRI</a>
<input type="radio"/> <a href="#">PNO+_IRI</a>	<input type="radio"/> <a href="#">PO+_IRI</a>	<input type="radio"/> <a href="#">PO2+_IRI</a>	<input type="radio"/> <a href="#">TE_IRI</a>	<input type="radio"/> <a href="#">TI_IRI</a>
<input type="radio"/> <a href="#">TN_IRI</a>				

## Neutral Atmosphere Parameter

<input type="radio"/> <a href="#">MOI</a>	<input type="radio"/> <a href="#">DMOI</a>	<input type="radio"/> <a href="#">NARI</a>	<input type="radio"/> <a href="#">DNARI</a>	<input type="radio"/> <a href="#">NHEI</a>
---	--	--	---	--



## Choose parameter to plot

Choose parameter to plot

http://www.eiscat.se/madrigal/cgi-bin/plotParametersSelect.py?callingpage=pl

Google

## Interplanetary Magnetic Field

- ☐ [BIMF](#)    ☐ [BXGSE](#)    ☐ [BXGSM](#)    ☐ [BYGSE](#)    ☐ [BYGSM](#)  
☐ [BZGSE](#)    ☐ [BZGSM](#)    ☐ [SWDEN](#)    ☐ [SWQ](#)    ☐ [SWSPD](#)

## Data Quality Parameter

- ☐ [CHIP3](#)    ☐ [CHISQ](#)    ☐ [GFT](#)    ☐ [POWER](#)    ☐ [SYSTMP](#)  
☐ [WCHSQ](#)

## Filter Data

Set limits for the parameter you selected (leave blank for all data)	Lower	<input type="text"/>	Upper	<input type="text"/>
Set altitude range (leave blank for all altitudes)	Lower	<input type="text"/>	Upper	<input type="text"/>

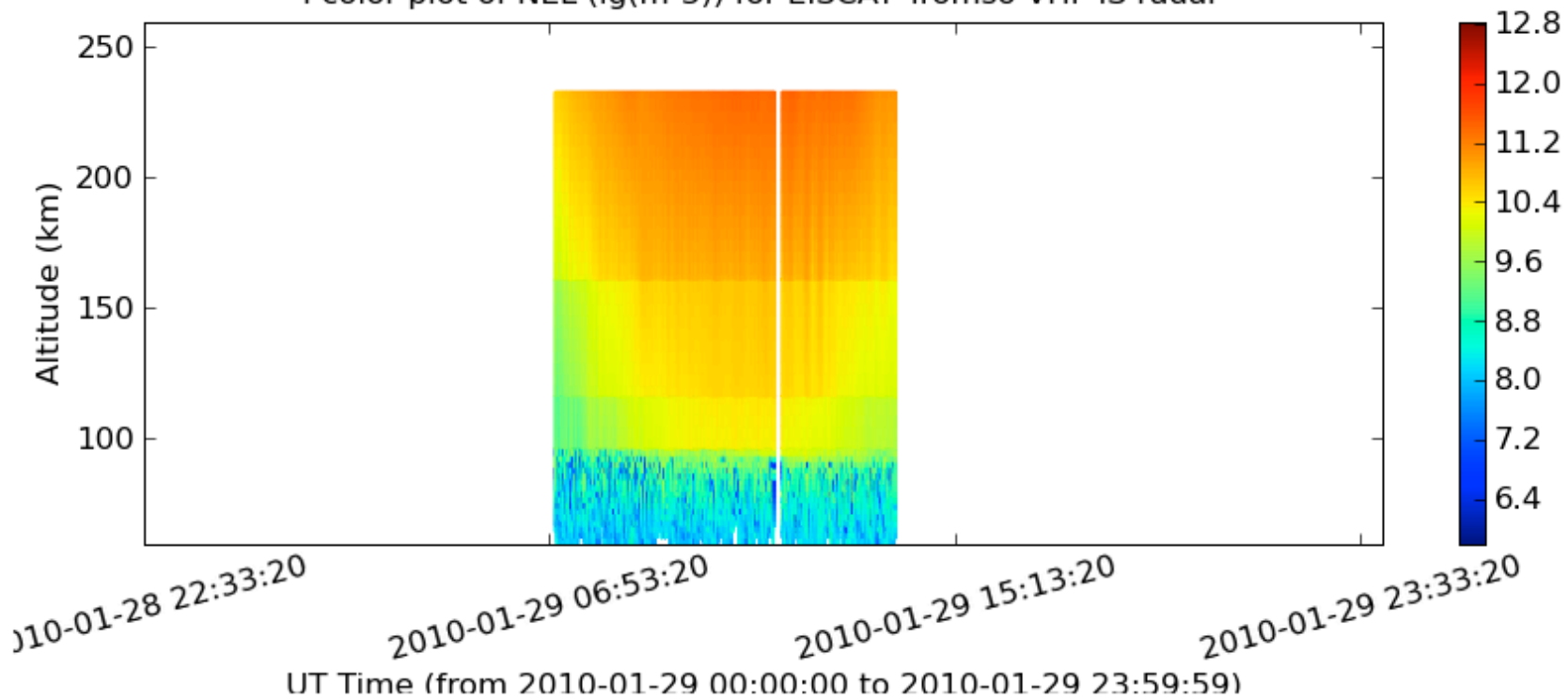
Optional - filter data using other parameters	Parm (use a name from list above)	<input type="text"/>	Lower	<input type="text"/>	Upper	<input type="text"/>
Optional - filter data using other parameters	Parm (use a name from list above)	<input type="text"/>	Lower	<input type="text"/>	Upper	<input type="text"/>
Optional - filter data using other parameters	Parm (use a name from list above)	<input type="text"/>	Lower	<input type="text"/>	Upper	<input type="text"/>



# Madrigal plots

The plot below is from Madrigal database at [EISCAT](http://www.eiscat.se) See their site for rules for data usage.

Pcolor plot of NEL ( $\lg(m-3)$ ) for EISCAT Tromso VHF IS radar



Create a new set of plots

Add another plot below



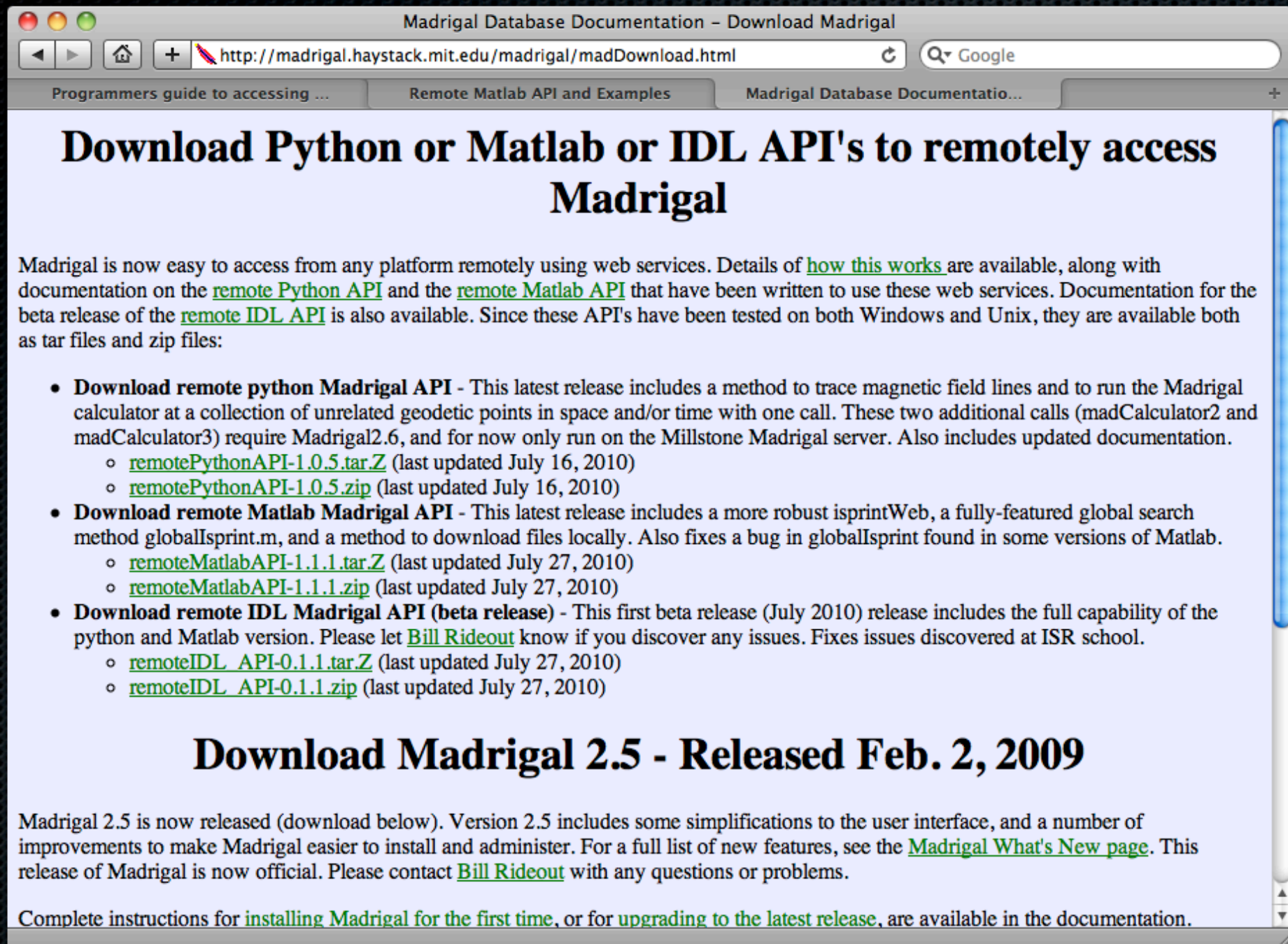
Play with it!



# Remote API

- ✦ Available in
  - ✦ Matlab
  - ✦ Python
  - ✦ IDL (beta stage)
  - ✦ Contribute your own... (later)





The screenshot shows a web browser window with the title "Madrigal Database Documentation - Download Madrigal". The address bar contains the URL "http://madrigal.haystack.mit.edu/madrigal/madDownload.html". The browser has three tabs open: "Programmers guide to accessing ...", "Remote Matlab API and Examples", and "Madrigal Database Documentatio...". The main content area has a large heading "Download Python or Matlab or IDL API's to remotely access Madrigal". Below this, a paragraph explains that Madrigal is now easy to access from any platform remotely using web services, with links to documentation for the remote Python API, remote Matlab API, and remote IDL API. A bulleted list provides details for each API, including download links and update dates. A second heading "Download Madrigal 2.5 - Released Feb. 2, 2009" is followed by a paragraph about the new version's features and a link to the "Madrigal What's New page". At the bottom, a line of text provides instructions for installing Madrigal for the first time or upgrading to the latest release.

Madrigal Database Documentation - Download Madrigal

http://madrigal.haystack.mit.edu/madrigal/madDownload.html

Programmers guide to accessing ... Remote Matlab API and Examples Madrigal Database Documentatio...

## Download Python or Matlab or IDL API's to remotely access Madrigal

Madrigal is now easy to access from any platform remotely using web services. Details of [how this works](#) are available, along with documentation on the [remote Python API](#) and the [remote Matlab API](#) that have been written to use these web services. Documentation for the beta release of the [remote IDL API](#) is also available. Since these API's have been tested on both Windows and Unix, they are available both as tar files and zip files:

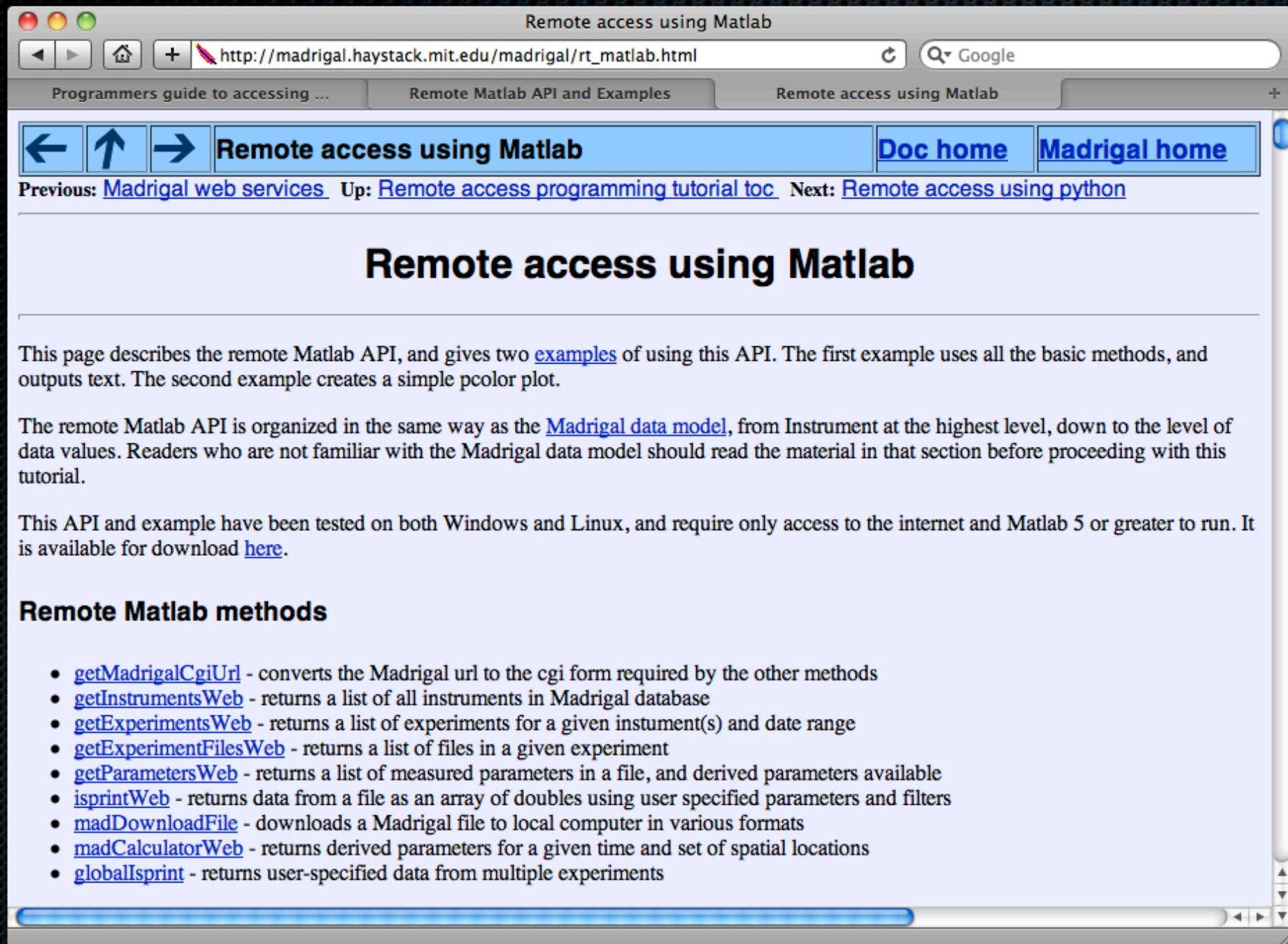
- **Download remote python Madrigal API** - This latest release includes a method to trace magnetic field lines and to run the Madrigal calculator at a collection of unrelated geodetic points in space and/or time with one call. These two additional calls (madCalculator2 and madCalculator3) require Madrigal2.6, and for now only run on the Millstone Madrigal server. Also includes updated documentation.
  - [remotePythonAPI-1.0.5.tar.Z](#) (last updated July 16, 2010)
  - [remotePythonAPI-1.0.5.zip](#) (last updated July 16, 2010)
- **Download remote Matlab Madrigal API** - This latest release includes a more robust isprintWeb, a fully-featured global search method globalIsprint.m, and a method to download files locally. Also fixes a bug in globalIsprint found in some versions of Matlab.
  - [remoteMatlabAPI-1.1.1.tar.Z](#) (last updated July 27, 2010)
  - [remoteMatlabAPI-1.1.1.zip](#) (last updated July 27, 2010)
- **Download remote IDL Madrigal API (beta release)** - This first beta release (July 2010) release includes the full capability of the python and Matlab version. Please let [Bill Rideout](#) know if you discover any issues. Fixes issues discovered at ISR school.
  - [remoteIDL API-0.1.1.tar.Z](#) (last updated July 27, 2010)
  - [remoteIDL API-0.1.1.zip](#) (last updated July 27, 2010)

## Download Madrigal 2.5 - Released Feb. 2, 2009

Madrigal 2.5 is now released (download below). Version 2.5 includes some simplifications to the user interface, and a number of improvements to make Madrigal easier to install and administer. For a full list of new features, see the [Madrigal What's New page](#). This release of Madrigal is now official. Please contact [Bill Rideout](#) with any questions or problems.

Complete instructions for [installing Madrigal for the first time](#), or for [upgrading to the latest release](#), are available in the documentation.







Remote access using Matlab

http://madrigal.haystack.mit.edu/madrigal/rt\_matlab.html

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Two examples are given below. The first example uses all the methods, and outputs text. The second example creates a simple pcolor plot.

### Simple Example - text output

This simple example Matlab script uses most of the methods discussed above.

```
% demo program of madmatlab running on a pc or linux

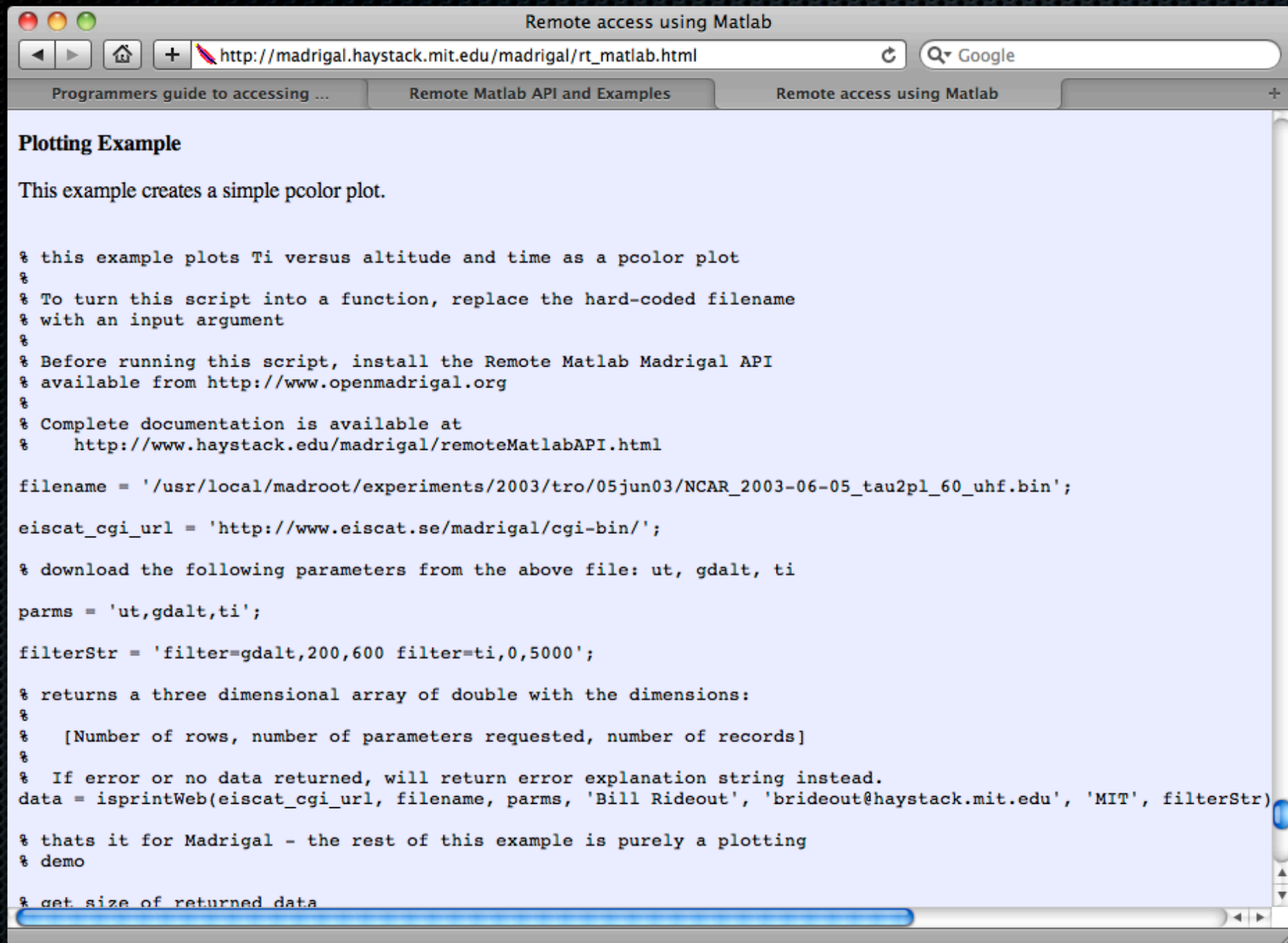
% first, get url of installation to test
madurl = input('Enter the url of the home page of the Madrigal site to test:', 's');

cgiurl = getMadrigalCgiUrl(madurl)

'List all instruments, and their latitudes and longitudes:'
instArray = getInstrumentsWeb(cgiurl);
for i = 1:length(instArray)
    [s,errmsg] = sprintf('Instrument: %s, at lat %f and long %f', ...
        instArray(i).name, ...
        instArray(i).latitude, ...
        instArray(i).longitude);
    s
end
% now list all experiments from local Madrigal site with mlh (code 30) in
% 1998 - should be data if default files installed...
startdate = datenum('01/01/1998');
enddate = datenum('12/31/1998');
expArray = getExperimentsWeb(cgiurl, 30, startdate, enddate, 1);
for i = 1:length(expArray)
    [s,errmsg] = sprintf('Experiment name: %s, at url %s and id %i', ...
        expArray(i).name, ...
        expArray(i).url, ...
        expArray(i).id);
    s
end

% now list all files in the first experiment
```







Remote access using python

http://madrigal.haystack.mit.edu/madrigal/rt\_python.html

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Previous: [Remote access using Matlab](#) Up: [Remote access programming tutorial toc](#) Next: [Remote access reference toc](#)

## Remote access using python

This page describes the remote Python API, and gives some examples of using this API. These examples have been tested on both Windows and Linux, and require only access to the internet and python 2.3 to run. It is available for download [here](#).

The remote Python API is organized in the same way as the [Madrigal data model](#), from Instrument at the highest level, down to the level of data values. Readers who are not familiar with the Madrigal data model should read the material in that section before proceeding with this tutorial.

The basic object in the remote Python API is the *MadrigalData*, found in the madrigalWeb module. To initialize *MadrigalData* requires only the url of the home page on any Madrigal 2.3 (or above) site as an argument. Calling the methods of this object will return all possible information from one Madrigal site. The other objects in madrigalWeb are simply there to hold returned information - for example, the *MadrigalExperiment* object holds information about one experiment.

MadrigalData has the following methods:

- ***getAllInstruments*** - returns a list of all *MadrigalInstrument* objects at all Madrigal sites
- ***getExperiments*** - returns a list of all *MadrigalExperiment* objects that meet the criteria you set at any Madrigal site
- ***getExperimentFiles*** - returns a list of all default *MadrigalExperimentFile* objects for a given experiment id
- ***getExperimentFileParameters*** - returns a list of all measured and derivable parameters in file
- ***isprint*** - returns as a string the isprint output given file, parms, filters without headers or summary. This is the method that accesses the raw data in a Madrigal data file.
- ***madCalculator*** - returns derived parameters for a range of latitudes, longitudes, and altitudes at a given time. Note that this method does not returned measured values from a file - use isprint for that. Instead, it is useful for accessing parameters available via the Madrigal derivation engine, such as magnetic field or MSIS parameters.
- ***madTimeCalculator*** - is similar to madCalculator, except that it returns data from a range of times, but only returns parameters such as Kp that are independent of position.



Remote access using python

http://madrigal.haystack.mit.edu/madrigal/rt\_python.html

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### Simple regression test

This simple script calls the following MadrigalData methods:

- getAllInstruments
- getExperiments
- getExperimentFiles
- isprint
- madCalculator

To use this regression test, cd to the examples directory in the installation directory, and type:

```
python testMadrigalWebServices.py http://www.haystack.mit.edu/madrigal
```

---

```
import madrigalWeb.madrigalWeb
import sys
import string
import difflib

if len(sys.argv) < 2:
    print 'usage: python testMadrigalWebServices.py <madrigal main url>'
    sys.exit(-1)

madrigalUrl = sys.argv[1]

outFile = open('testMadrigalWebServices.out', 'w')

# create the main object to get all needed info from Madrigal
testData = madrigalWeb.madrigalWeb.MadrigalData(madrigalUrl)

instList = testData.getAllInstruments()

# print out Millstone
for inst in instList:
    if inst.code == 30:
```



# Again: play with it!

- Take the on-line examples and work through them!



Contributing...



# Extending Madrigal

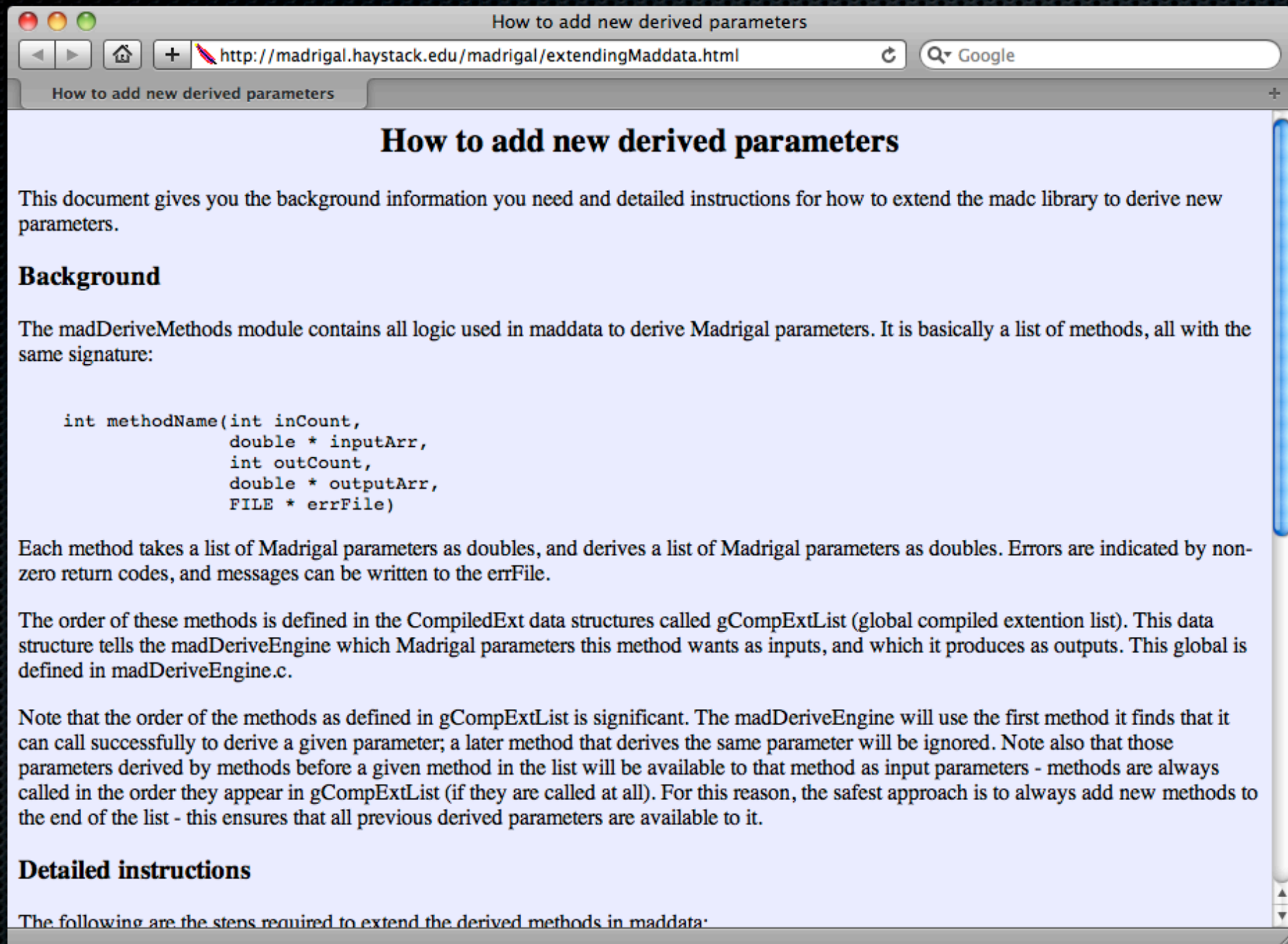
- ✦ Madrigal is **open source**!
- ✦ CVS at [www.openmadrigal.org](http://www.openmadrigal.org)
- ✦ Code is in C, Python and some Tcl
- ✦ Extending the Madrigal Derivation Engine is simple



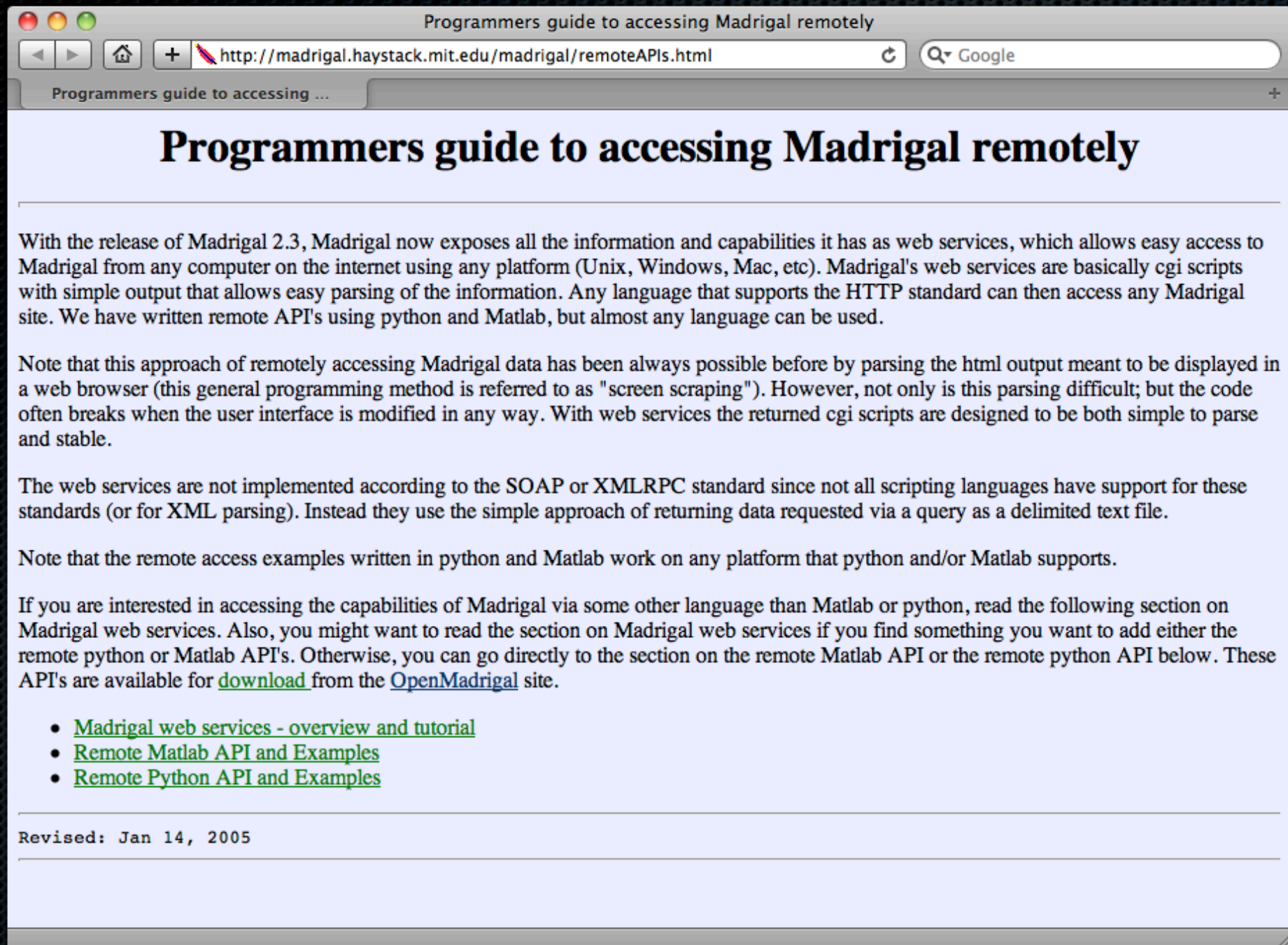
# Extending...

- ✧ Simply a list of methods with
  - ✧ input Madrigal parameters
  - ✧ output Madrigal parameters
- ✧ Register parameters in list
- ✧ Details here:  
<http://madrigal.haystack.edu/madrigal/extendingMaddata.html>









## Programmers guide to accessing Madrigal remotely

With the release of Madrigal 2.3, Madrigal now exposes all the information and capabilities it has as web services, which allows easy access to Madrigal from any computer on the internet using any platform (Unix, Windows, Mac, etc). Madrigal's web services are basically cgi scripts with simple output that allows easy parsing of the information. Any language that supports the HTTP standard can then access any Madrigal site. We have written remote API's using python and Matlab, but almost any language can be used.

Note that this approach of remotely accessing Madrigal data has been always possible before by parsing the html output meant to be displayed in a web browser (this general programming method is referred to as "screen scraping"). However, not only is this parsing difficult; but the code often breaks when the user interface is modified in any way. With web services the returned cgi scripts are designed to be both simple to parse and stable.

The web services are not implemented according to the SOAP or XMLRPC standard since not all scripting languages have support for these standards (or for XML parsing). Instead they use the simple approach of returning data requested via a query as a delimited text file.

Note that the remote access examples written in python and Matlab work on any platform that python and/or Matlab supports.

If you are interested in accessing the capabilities of Madrigal via some other language than Matlab or python, read the following section on Madrigal web services. Also, you might want to read the section on Madrigal web services if you find something you want to add either the remote python or Matlab API's. Otherwise, you can go directly to the section on the remote Matlab API or the remote python API below. These API's are available for [download](#) from the [OpenMadrigal](#) site.

- [Madrigal web services - overview and tutorial](#)
- [Remote Matlab API and Examples](#)
- [Remote Python API and Examples](#)

Revised: Jan 14, 2005



# Want More?

- ✦ Contains more examples and exercises.
  - ✦ [http://www.haystack.mit.edu/cgi-bin/asg\\_science/science.cgi/Using\\_Madrigal\\_practically\\_and\\_productively](http://www.haystack.mit.edu/cgi-bin/asg_science/science.cgi/Using_Madrigal_practically_and_productively)
- ✦ Please work through these.



Using Madrigal practically and productively – Millstone Hill Science Wiki

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# Using Madrigal practically and productively

## Madrigal database exercises - overview

Each group will do the following exercises:

1. Go through the web interface exercises below
2. Install one (or more) remote APIs (python, Matlab, or IDL)
3. Run and then modify the example script in the language of choice that gets the latest Poker Flat data on Madrigal
4. Run and then modify the example script in the language of choice that runs the globallsprint example

### Links and scripts to download (will be used below)

- [attachment:Madrigal\\_isr\\_workshop\\_2010.pdf](#) Madrigal Powerpoint talk (Bill Rideout)
- [▶ SRI Madrigal](#) web site
- [▶ Millstone Madrigal](#) web site
- [▶ OpenMadrigal](#) web site

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Thanks!