Brief overview of the Madrigal database

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

> Incoherent Scatter Radar





TEC via

GPS

Examples of number of instruments in Madrigal:

- Incoherent scatter radars: 22
- MST radars: 3
- MF radars: 16
- Meteor radars: 11
- FPI: 32
- Michelson Interferometers: 6
- Lidars: 9
- Photometers: 7
- DMSP

The Madrigal database is distributed, but all sites archived to CEDAR Madrigal



How can the Madrigal database be accessed?



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. 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 from any Madrigal site.

To see a list of all Madrigal sites, use the Other Madrigal sites pull down menu. Data can also be accessed directly, using APIs which are available for several popular programming languages (Matlab, python, and IDL). A Subversion archive of all Madrigal and the remote API's may also be downloaded from there.

se of the Madrigal Database is generally subject to the CEDAR Rules-of-the-Road. Prior permission to access the data is not required. However, the user 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 initiations 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-supplying organizations along with an offer of co-authorship to scientists who have provided data. This offer may be eclined. The Database and the organizations that contributed data must be acknowledged in all reports and publications, and whenever this data is made valiable through another database. If you have any questions about appropriate use of these data, contact brideout@haystack.mit.edu

you want to use the old Madrigal 2 version of the CEDAR Madrigal databse, it is still temporarily available at http://madrigal.haystack.mit.edu. If you ar

Web browsing - for data discovery/ small downloads

Web services API

CEDAR Home Access data -

- •From anywhere on internet
- Python API
- •Matlab API
- •IDL API
- Allows automated
- downloads

	CEDAR Home	Access data -	Run mo	dels -	Docume	
	List experiments Download software Select single experiment Create a command to download multiple exps				vare first?	
1	Select what kind	FTP-like acces	access			
Download a group of files as is Download data with selected parms/filters						

Use web interface to create scripts to fetch any amount of data in python, Matlab, or IDL - large downloads

Select file: gps220104g.002.hdf5: TEC binned 1 degree by 1 degree by 5 min - final 🗘						
Plots/Docs	Download file -	Print file - V	/iew file info	Cite this file		
Use the citation below to reference this data file. The url is meant to be a permanent url. This data file may later be updated, but this link will still point to the original version of the data file.						
Anthea Cos	ster, MIT/Haystack	observatory. (2022) Data f	rom the CEDAR Mad	rigal database. A	vailable from https:

Every file has permanent citation available; citations to groups of files can be created with API

How can I put my instrument's data on Madrigal? (Hint: its really easy...)

Send data to CEDAR Madrigal

Madrigal DB



- Send data/plots to MIT Haystack in <u>your own format</u>
 Loading program written by
- Loading program written by MIT Haystack, verified by you
- Add new data in batch or via automated upload (eg, sftp, web access, etc)

<section-header>

- MIT Haystack will help with installation and writing needed loading programs
- You control when data uploaded
- Automated backup to central CEDAR Madrigal site³

Example of satellite data in Madrigal

DMSP

- We create one file per satellite per UT day per data type
- Types: scalars at one second cadence, scalars at four second cadence, vector flux values at one second cadence
 Madrigal can handle scalar data or data with any number of independent parameters

Adding plots of satellite data in Madrigal

Any number of plots can be shown, including documentation

Select file: dms_20211231_16e.001.hdf5: F16 flux/energy values - Final									
	Plots/Docs	Download	l file 🗕 🛛 Pr	int File Vie	ew file info	Cite this file			
	F16 low laF16 high laGeneral in	titude plots atitude plots formation o	n DMSP data	L					
	 F17 low latitude plots F18 high latitude plots F18 low latitude plots F17 high latitude plots 								

Typically plots are created by the instrument PI, since they have the most experience making their data easily understood -Generic plots are rarely satisfactory

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Click on small image to see full size image