Introduction
Madrigal is a database of ground-based measurements and models of the Earth’s upper atmosphere and ionosphere. It is closely related to the Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) program, which is devoted to the characterization and understanding of the atmosphere above about 60 km, with emphasis on the various processes that determine the basic structure and composition of the atmosphere, and on the mechanisms that couple different atmospheric regions. Instruments involved in CEDAR projects include interferometers, spectrometers, imagers, radars, and medium, high-frequency and incoherent scatter radars.

The Rules of the Road
These data are the intellectual property of the owners of the instruments. They may be freely used 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 associated with the individual instruments in order to clarify matters of use, calibration and potential co-authorship. Any further discussion of these data, including installation in any database, must be accompanied by this statement and subject to the same conditions of use.

Accessing the Data
Data are accessed by first using the inventory program to specify a list of available experiments, and then selecting a particular experiment from that list. The selected experiment page then offers several options for viewing or retrieving the data.

Data Viewing Options
Data viewing options typically include premade summary plots, Isprint for ASCII flat file listing of selected data and ISGrapher for interactive data plotting.

Madrigal Homepage
Madrigal is accessed through the Madrigal homepage, at any Madrigal installation. Data Usage is subject to the “Rules of the Road.”

Madrigal Features
• Madrigal is DISTRIBUTED
  Each Madrigal installation references both local data and data held at other sites and users can therefore access all available datasets transparently through any Madrigal gateway.

• Madrigal is FLEXIBLE
  The Madrigal distribution is designed to be easily downloadable and installed with all site-specific details being restricted to well-defined configuration files. In addition to the original installation at Millstone Hill, Madrigal has been installed at the EISCAT Scientific Association and the Kiruna, incoherent scatter radar. In the near future, planned Madrigal installations will also be operational at Ascot and Sussex.

• Madrigal is REAL-TIME
  An important feature of Madrigal is that processed data files can be updated in real time and served to remote users either directly through the World Wide Web, or indirectly through the Space Physics and Aeronomy Research Collaboratory (SPARC), headquartered at the University of Michigan. Data are served to SPARC through a SPARC Data Center implementation, which may also be used to transfer data between different Madrigal installations. The latter capability can be particularly useful in cases where limited network bandwidth is available between a radar and the Internet. In this case, data can be relayed to multiple users through a Madrigal installation which has a high-speed connection to the Internet.

• Madrigal is USER FRIENDLY
  The Madrigal WWW interface allows users to browse the entire database, generate configurable data plots using the familiar ISGrapher tool, select and display tabulated data using powerful features of ISPRINT and download selected data as ASCII or NCAR binary.

• Madrigal is PORTABLE
  Madrigal can be installed at any site with a high-speed connection to the Internet. This latter capability can be particularly useful in cases where limited network bandwidth is available between a radar and the Internet. In this case, data can be relayed to multiple users through a Madrigal installation which has a high-speed connection to the Internet.

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Real-time Data
The Madrigal Database can be updated in real-time. So, the tools used to access archived data can also be used for real-time data, as in this screenshot example.

Summary
Madrigal provides both the casual user and the sophisticated data analyst with seamless access to nearly 30 years of accumulated data which, together represent one of the greatest under-exploited resources available to atmospheric, magnetospheric and astrophysical physicists and modelers.

http://www.eiscat.uit.no/madrigal
http://www.haystack.edu/madrigal