Geophysical Institute Magnetometer Array

Debi-Lee Wilkinson, Matt Heavner   Geophysical Institute, University of Alaska, matt.heavner@uas.alaska.edu   http://magnet.gi.alaska.edu/

ABSTRACT

The Geophysical Institute Magnetometer Array (GIMA) consists of twelve magnetometer stations distributed across Alaska cutting the auroral oval. Each station is equipped with a ring-core, fluxgate magnetometer, GPS clock and data logger. Data are returned from each station to the Geophysical Institute, University of Alaska where it is verified, archived, and made available to the space science community. The GIMA web page, at http://magnet.gi.alaska.edu/, provides the data from eight stations online in real-time. The GIMA web page also provides limited data access from five Russian magnetometer stations. The GIMA data set available online spans the time period 1995 to the present. This presentation describes the current operation of the array, its capabilities (data collection parameters), the web site, and methods for accessing the data set. Current efforts to improve data access and integrate the data set with online virtual observatories is described.

INSTRUMENTS

The Narod ring-core magnetometer used by the Geophysical Institute is manufactured by Narod Geophysics Ltd. of Canada. The magnetometer is a fluxgate design using a triaxial set of cores. The sensor cores are shown here in the GI enclosure. A carefully machined ceramic block (the white block in the center) holds each of the three cores in mutually orthogonal directions. The cores are wrapped in copper wire. Two can be seen in this photo. The ceramic block is mounted to the base of an aluminum enclosure designed and manufactured at the Geophysical Institute. The blue-anodized aluminum cover encloses and seals the sensor block from the elements. The gold-anodized aluminum housing is mounted on a platform which can be leveled and oriented to any azimuth. The red cable attaches the sensors to the preamplifier (the black box on the table).

The characteristics of the Narod system are:

Temperature stability: <0.1nT/degree (sensor)

Long term drift: < 10 pT/day

Noise: 7 pT/Hz^(1/2) @ 1Hz

Orthogonality error: <0.1 degree

Digitization: 16 bits

The magnetometer electronics are controlled by an S-100 computer that uses internal calibrations to produce digital output in units of nano Tesla. The nominal data rate is 8 samples per second. The unit also has the capability of digitizing other signals and including them in the output data stream. We use this function to include an IRIG D slow-code time signal that is generated by a GPS clock in one data channel for absolute timing.

ARRAY

GIMA consists of 12 magnetometers currently operating (9 of which are archived daily) forming a north-south chain across Alaska. In addition, the Project for Upgrading Russian AE Stations (PURAES) dataset is processed, archived, and available with the GIMA data set.
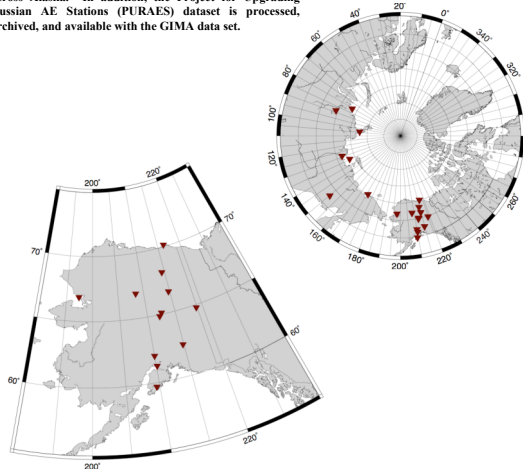

STATION INFORMATION

The Geophysical Institute Magnetometer Array (GIMA) consists of eleven magnetometer stations distributed across Alaska cutting the auroral oval. The geographic and geomagnetic locations of the GIMA and PURAES stations are described in the table below. Additionally, the existence of real-time (within 10 seconds) and the span of the station data set are described in the table.

Station	Geogr Lat	Geogr Lon	Geomag Lat	Geomag Lon	Real Time?	Dates (year/DOY)
GIMA/Arctic	68.118	214.44	68.70	269.05	Yes	2000/245 - present
GIMA/Bettles	66.901	208.45	66.57	256.15	No	1997/006-2006/240
GIMA/CIGO	64.873	212.14	65.38	261.63	Yes	1999/032-present
GIMA/Eagle	64.78	218.838	66.48	268.07	No	1995/258-present
GIMA/FtYukon	66.56	214.78	67.37	262.27	Yes	1996/337-present
GIMA/Gakona	62.393	214.87	63.59	266.51	Yes	1998/295-present
GIMA/HLMS	61.235	210.128	61.68	262.94	Yes	2004/324-present
GIMA/Homer	59.7	209.53	60.14	263.5	Yes	2004/325-present
GIMA/Kaktovik	70.135	216.35	70.79	258.90	Yes	1999/013-present
GIMA/Kodiak	57.6	207.8	57.9	263.3	Yes	Being installed
GIMA/Koror	73.3	134.4	63.7	196.6	No	1994/218-1994/365
GIMA/Kotzebue	66.85	197.39	64.66	246.70	No	1994/244-1996/119
GIMA/Poker	65.119	212.57	65.68	261.78	Yes	2000/012-present
GIMA/Talkeetna	62	210	62	262	No	1997/011-2000/019
GIMA/Trapper	62.24	209.58	62.51	261.62	Yes	2004/323-present
PURAES/Amderma	69.5	61.6			No	2006/143-present
PURAES/Chelynskin	77.7	104.3	67.5	177.8	No	2002/091-present
PURAES/Dixon	73.5	80.6	64.0	162.5	No	2005/222-2006/094
PURAES/Norilsk	69.4	88.4	59.6	166.4	Yes	2002/091-present
PURAES/Pebek	70.1	170.9	63.8	223.3	No	2002/170-2005/252
PURAES/Tixie Bay	71.6	129.0	61.8	193.7	Yes	2002/170-present

IGRF-10, 2005

SAMPLE DATA

The recent CAWSES Campaign focused on May 15 and August 24, 2005. Representative GIMA data from three stations are shown for both dates below.


ACCESSING THE DATA

http://magnet.gi.alaska.edu/
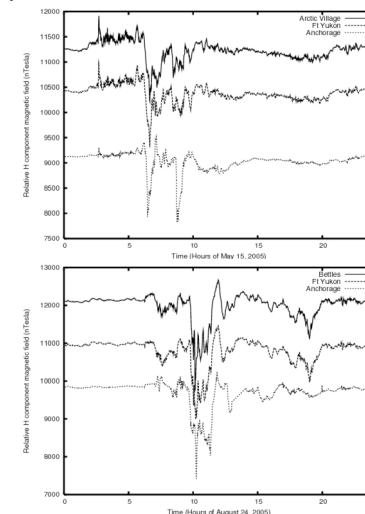
You may access our data by multiple methods. The main portal is at http://magnet.gi.alaska.edu/ From there you can:

1. Use our access data form. Use this when you know the exact date for which you wish to find data. This method involves a series of drop-down menus where you select the site, year, month, and day that you wish to view. You then get previous and next buttons to further navigate the data if you wish.

2. View tables of all our data. The tables are organized in 2 ways:
   Data for all years for one station
   Data for all stations for one year
   Use this method to see if data exists for a block of dates or multiple stations for the same date.

3. Use data lists for each station to browse the data for quiet or active periods. These lists are first broken down by site then by year. Once you click a site below you'll see a single year's listing. You can then choose a different year if you wish or pick a day to view. This interface is most like our original listings.
   * Arctic Village, Alaska, USA
   * Bettles, Alaska, USA
   * CIGO, College Intern'l Geophysical Observatory, Alaska, USA
   * Eagle, Alaska, USA
   * Fort Yukon, Alaska, USA
   * Gakona, Alaska, USA
   * HLMS - Anchorage, Alaska, USA
   * Homer, Alaska, USA
   * Kaktovik Alaska, USA
   * Poker Flat, Alaska, USA
   * Trapper Creek, Alaska, USA
   * Compiled H component from All sites

4. You can also use our form to download a block of one minute data. The data cannot span more than one year or one site. For a block of one second data or other special request, send email specifying the station, dates, and requested format and protocol (ftp, tar, zip, etc.).

5. View near real-time data in an auto-updating web page (updates every 8 seconds).
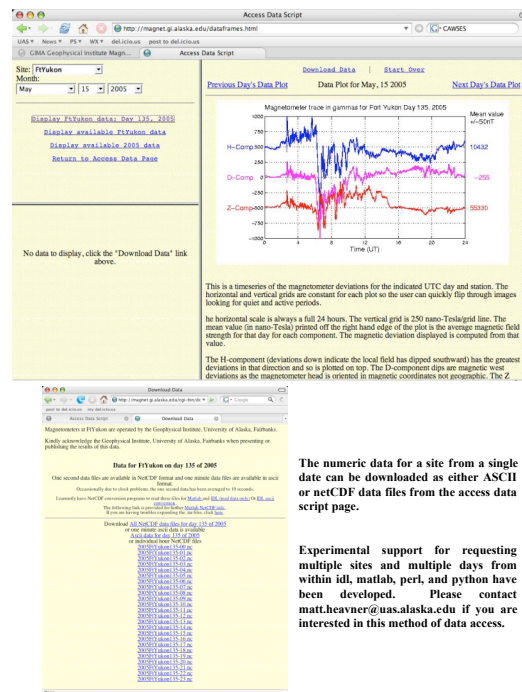
The numeric data for a site from a single date can be downloaded as either ASCII or netCDF data files from the access data script page.

Experimental support for requesting multiple sites and multiple days from within idl, matlab, perl, and python have been developed. Please contact matt.heavner@uas.alaska.edu if you are interested in this method of data access.

ACKNOWLEDGEMENTS