

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Geomagnetic Disturbance (GMD) Event Data Download Training

May 4, 2022

RELIABILITY | RESILIENCE | SECURITY



- Introduction
- Training Topics:
 - Reporting Process
 - Events
 - Types of Data
 - ERO Portal
 - Creating Account
 - Accessing the Data
 - Download Process
 - Selecting Criteria
 - Data Packages
 - Exports



Introduction

- Understand the GMD data collection requirement
 - Who must report?
 - What is reported?
 - Reporting Deadlines
- How to search devices and event data
- How to download event data

- FERC Order No. 830 directs NERC to collect GMD data to “improve our collective understanding” of GMD risk
- NERC developed the GMD Data Request with GMD Task Force (GMDTF) and technical committee input
 - In August 2018, NERC Board approved Rules of Procedure Section 1600 data request for collecting GMD data
- Reporting entities must report data annually by June 30
 - First collection deadline is June 30, 2021

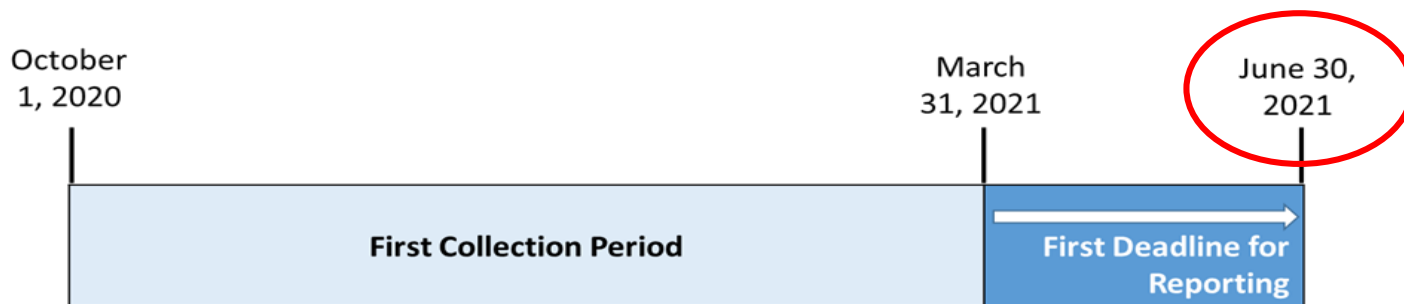
[The Commission] also direct NERC, pursuant to Sections 1500 and 1600 of the NERC Rules of Procedure, to collect and make GIC monitoring and magnetometer data available. We determine that the dissemination of GIC monitoring and magnetometer data will facilitate a greater understanding of GMD events that, over time, will improve Reliability Standard TPL-007-1. The record in this proceeding supports the conclusion that access to GIC monitoring and magnetometer data will help facilitate GMD research, for example, by helping to validate GMD models.

- Order No. 830 P 93

- Transmission Owners (TO) and Generator Owners (GO) are required to provide information and data specified in the data request
- TOs and GOs that collect GIC data or magnetometer data are considered **Reporting Entities** for GMD events specified in the GMD Data Request
- The GMD data request applies to only U.S. registered entities
 - Registered entities in other NERC jurisdictions including Canada are encouraged to participate in order to collect relevant GMD data for the North American Bulk-Power System

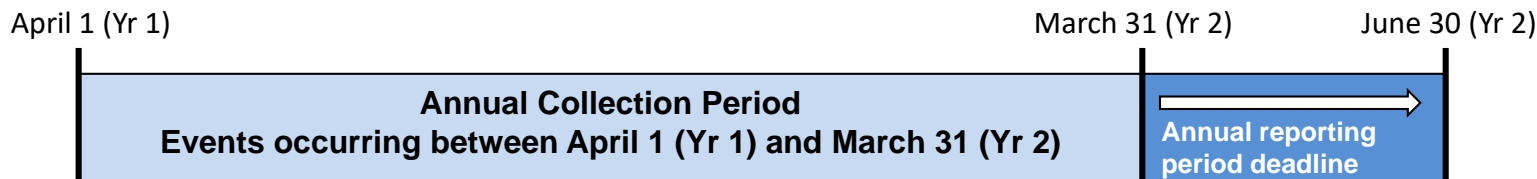
- Reporting Entities provide the following types of data for time periods during which GMD events have a rating of $K_p=7$ or greater
 - Geomagnetically-induced current (GIC) data for designated GMD events
 - Geomagnetic field data for designated GMD events
- Continuously-sampled GIC or magnetometer measurements (amps) (e.g., 10-second sample rate) throughout the GMD event
- NERC will designate GMD events of interest in collaboration with NOAA Space Weather Prediction Center (SWPC)
 - On average, 200 $K_p=7$ or greater GMD events occur in 11-year solar cycle

- Reporting for historical events, and any 2021 events occurring through March 31, was due by June 30, 2021 *First Mandatory Reporting Deadline*



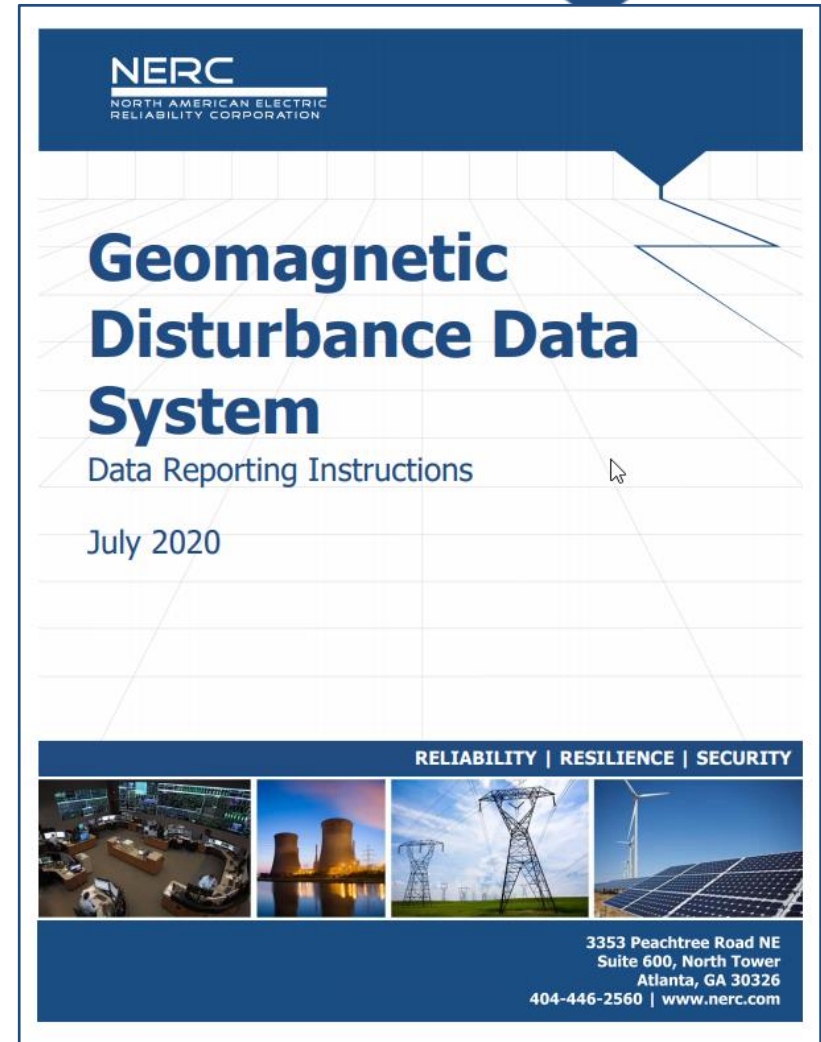
First GMD Data Collection Reporting Period and Timeline

- Reporting for GMD Events of Interest must be reported annually by June 30 of each reporting year



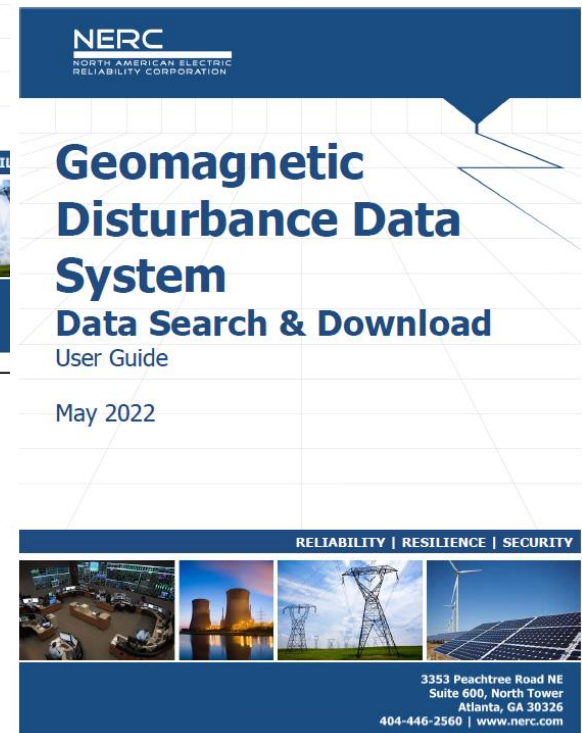
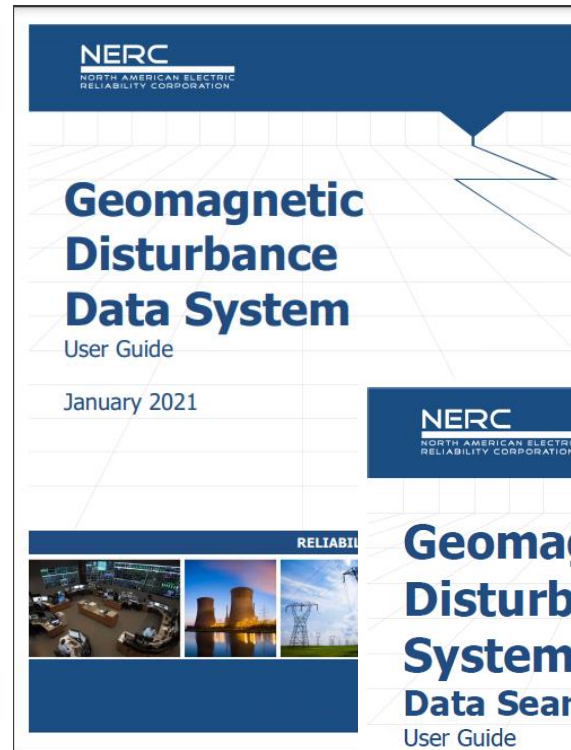
Annual GMD Data Collection Reporting Period and Timeline

- Data Reporting Instructions (DRI) document was developed by NERC with GMDTF support
 - Specifies processes, formats, and timelines for data collection



<https://www.nerc.com/pa/RAPA/GMD/Pages/GMDHome.aspx>

- Geomagnetic Disturbance Data System
 - For users who have monitoring equipment and report GMD event data
- Geomagnetic Disturbance Data System – Data Search & Download
 - For third-party retrieval of reported event data



<https://www.nerc.com/pa/RAPA/GMD/Pages/GMDHome.aspx>

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Event Analysis

- Event Analysis
- Energy Emergency Alerts
- Lessons Learned
- Major Event Reports
- EA Program

Human Performance

Modeling Assessments

Reliability Assessments

Performance Analysis

Section 1600 Data Requests

Reliability Indicators

- Demand Response Availability Data System (DADS)
- Generating Availability Data System (GADS)

Geomagnetic Disturbance Data (GMD)

Transmission Availability Data System (TADS)

Protection System Misoperations (MIDAS)

Electricity Supply & Demand (ES&D)

Bulk Electric System Definition, Notification, and Exception Process Project

Committees

- Reliability and Security Technical Committee (RSTC)

Webinars

Compliance & Enforcement

- Organization Registration and Certification
- Standards
- Electricity ISAC
- Event Analysis, Reliability Assessment, and Performance Analysis**
- Bulk Power System Awareness
- System Operator Certification & Credential Maintenance Program

Event Analysis, Reliability Assessment, and Performance Analysis > Geomagnetic Disturbance Data (GMD)

Geomagnetic Disturbance Data (GMD)

Disturbances in Earth's magnetic field have the potential to disrupt operations or cause damage to critical infrastructure, including power systems. Extremely strong GMD events, though rare, can induce strong quasi-dc currents in the electric power grid that could affect system voltages, relay and protection system performance, and the operation and health of some large power transformers.

Through the GMD data collection program, NERC is collecting GIC and magnetometer data from reporting entities for designated strong GMD events (Kp = 7 and greater). As specified in FERC Order No. 830, NERC will make collected GIC and magnetometer data available to support ongoing research and analysis.

For more information about GMD, please contact gmd@nerc.net

[Click here to report GMD Data: GMD Reporting Application](#)

GMD Events					
Event ID Number	Kp	Start Date	Start Time (UTC)	End Date	End Time (UTC)
2013E01	7	05/31/2013	15:00	06/01/2013	15:00
2013E02	8	10/02/2013	00:00	10/03/2013	03:00
2015E01	8	03/17/2015	03:00	03/18/2015	06:00
2015E02	8	06/22/2015	03:00	06/23/2015	15:00
2015E03	7	09/11/2015	03:00	09/11/2015	18:00
2015E04	7	09/19/2015	18:00	09/20/2015	18:00
2015E05	7	10/06/2015	18:00	10/09/2015	09:00
2015E06	7	12/20/2015	03:00	12/21/2015	09:00
2017E01	7	05/27/2017	15:00	05/28/2017	15:00
2017E02	8	09/07/2017	21:00	09/09/2017	03:00
2017E03	7	09/27/2017	15:00	09/29/2017	00:00
2018E01	7	08/25/2018	18:00	08/27/2018	00:00
2021E01	7	05/12/2021	00:00	05/13/2021	12:00
2021E02	8	11/03/2021	15:00	11/04/2021	23:59

GMD News

GMD Event Data Download training is scheduled for May 4, 2022 at 2 pm. Registration is required. [Click here for: Training Registration](#)

On October 1, 2020, the GMD Reporting Application was released and is available for reporting.

April 2021 - The GMD User Guide has been updated. To view the updated version, click here.

Key Links

[GMD Training](#)

[GMD - Section 1600 Data Request](#)

[GMD User Guide](#)

GMD Reference Documents

Type Title

Key GMD Documents (1)

- Section 1600 Confirmation for No GMD Equipment

Reporting Instructions (1)

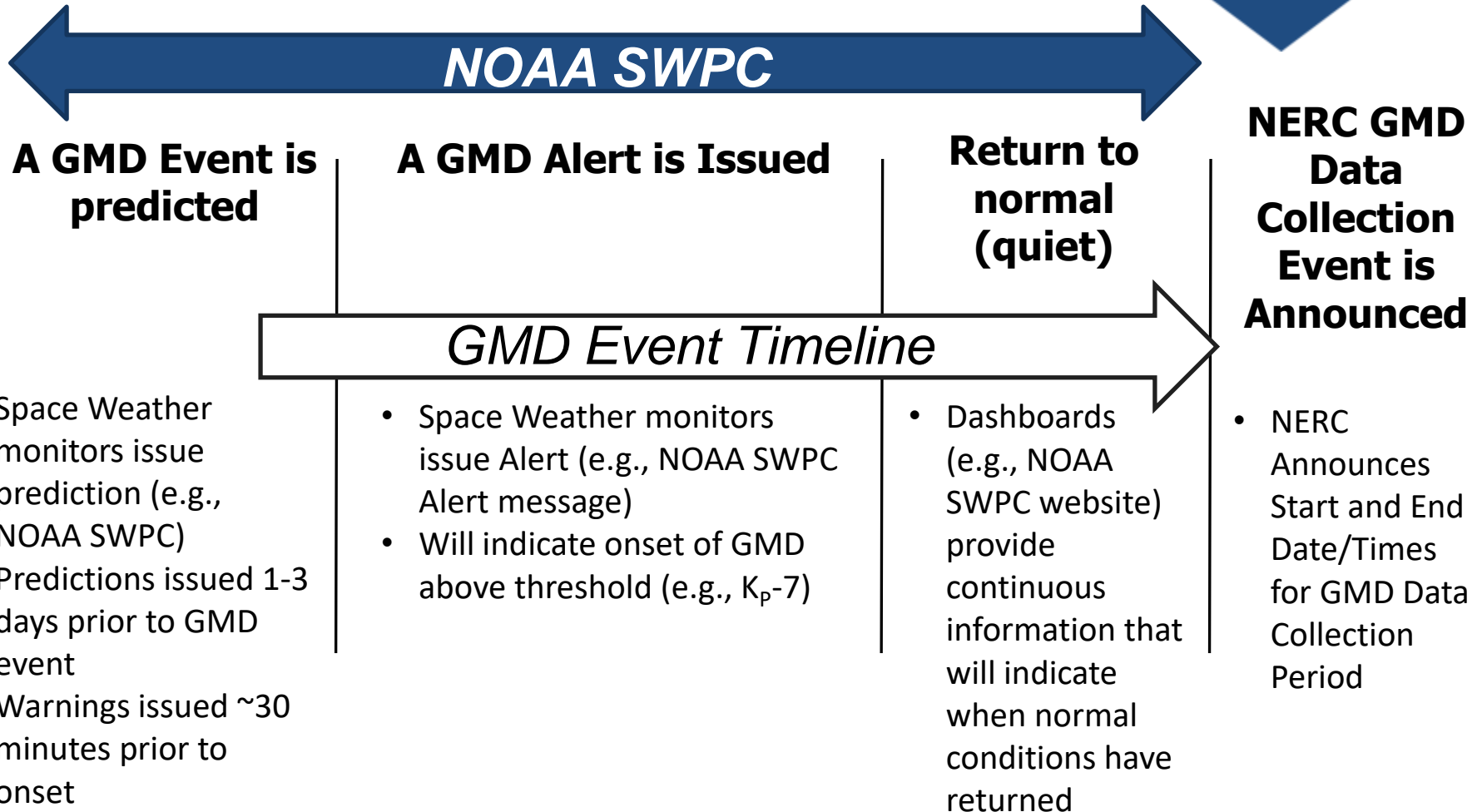
- GMD Data Reporting Instructions

Reporting Templates (7)

- GIC Monitor Data Template
- GIC Monitor Device Template
- GMD Confidential Information Designation Request Form
- Magnetometer Data Template
- Magnetometer Device Template
- Missing Data - Data Quality Report Template
- Process for Requesting Confidential Treatment of GMD Data

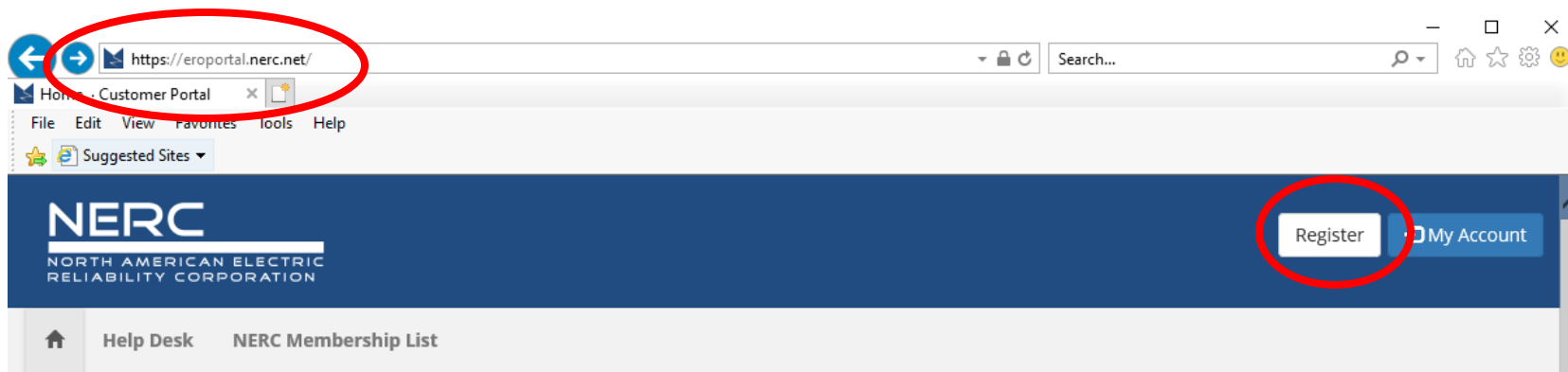
The GMD Reporting Process

- Types of data that are reported :
 - GMD monitoring equipment (GIC Monitor, Magnetometer)
 - GIC measurement data for designated GMD events
 - If data is missing, then Missing Data Reports can be submitted
 - Geomagnetic field measurement data for designated GMD events
 - Missing Data Reports
 - Gaps of data of more than 10 minutes from one or more devices for all, or portions of a GMD Event, are required to be reported on a Missing Data Report for the event
 - Users have the ability to deactivate a Missing Data Report for a device if event data later becomes available



ERO Portal: Creating an Account & Accessing the Data

<https://eroportal.nerc.net>



Welcome to the ERO Portal

The ERO Portal allows new users to register for an account and perform the following functions upon completion:



SELF SERVICE ACCOUNT

Change Password, Update Security
Questions



VIEW MAILING LISTS & RESOURCES

Access to Datastores and
Applications



REQUEST ACCESS

Get Access to Resources

*An ERO Portal account is required to access the GMD reporting application

Register for a new account

1

* First Name

* Last Name

* Email


* Confirm Email

* Username

* Password

- Minimum of 10 characters long.
- Must Contain at least 1 number, 1 lowercase letter, 1 uppercase letter, and 1 special character (!,@,#,\$,%,&,*).

* Confirm Password



* Captcha

2

Confirm Registration

You will receive an email shortly with instructions on how to complete the registration process.

If you do not receive an email, please click [here](#) to resend.

If the problem continues, please contact the NERC Helpdesk by opening a ticket at: [NERC Helpdesk](#).

3

Thanks so much for registering for access to the ERO Portal. To continue with your registration, you just need to confirm that we got your email right.

[Confirm Your Email](#)

Link not working? Try pasting this link into your browser:

4

Email Confirmation

Your email address was successfully confirmed. Please click 'Continue' to complete your registration!

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For security reasons, we require additional information to verify your account

Protect Your NERC - External Clients Account

[What is this?](#) [Need help?](#)

Two-factor authentication enhances the security of your account by using a secondary device to verify your identity. This prevents anyone but you from accessing your account, even if they know your password.

This process will help you set up your account with this added layer of security.

Start setup

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Choose an authentication method

Send Me a Push

Call Me

Enter a Passcode

Remember me for 10 hours

Enrollment successful! This is the Duo login prompt that you'll normally see when logging in. X

[What is this?](#) [Add a new device](#) [My Settings & Devices](#) [Need help?](#)

Personal

Salutation	First Name *
<input type="text"/>	<input type="text" value="MIDAS"/>
Job Title	Middle Name
<input type="text"/>	<input type="text"/>
Business Phone *	Last Name *
<input type="text" value="770-777-7777"/>	<input type="text" value="Example User"/>
Fax	Mobile Phone
<input type="text"/>	<input type="text"/>

My Work Address

Street 1 *	City *
<input type="text" value="3353 Peachtree Road"/>	<input type="text" value="Atlanta"/>
Street 2	State/Province *
<input type="text"/>	<input type="text" value="Georgia"/>
	ZIP/Postal Code *
	<input type="text" value="30326"/>
	Country *
	<input type="text" value="USA"/>

Company

Company

Did you find your company?

No Yes

Security

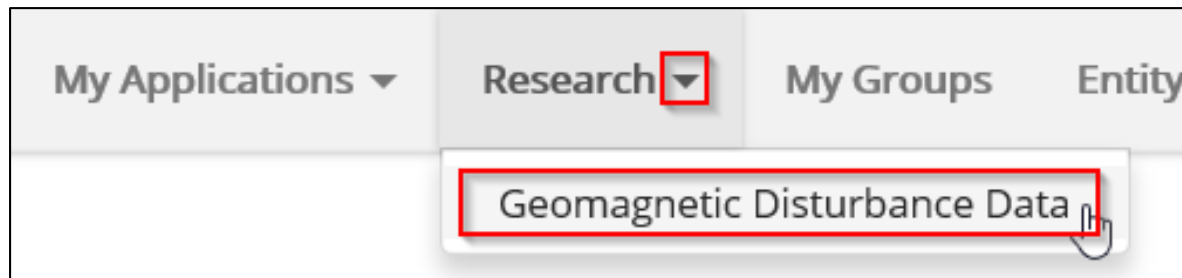
Security Question 1 *

Security Answer 1 *

Security Question 2 *

Security Answer 2 *

- Once you have successfully created an ERO Portal account, you now have the ability to access the GMD Data.
- To access the data, click the dropdown arrow next to the “Research” tab and choose “Geomagnetic Disturbance Data”.



Geomagnetic Disturbance (GMD) Data Download

Welcome to the GMD Data Research and Download page!

GIC Monitor and Magnetometer data are available to support ongoing research and analysis of GMD events. Search and download specific GMD event data and/or view a list of existing GIC Monitors and Magnetometers.

Event ID ↑	KP	Event Start Date and Time	Event End Date and Time
2021E01	7	5/12/2021 00:00	5/13/2021 12:00
2018E01	7	8/25/2018 18:00	8/27/2018 00:00
2017E03	7	9/27/2017 15:00	9/29/2017 00:00
2017E02	8	9/7/2017 21:00	9/9/2017 03:00

Menu

[GMD Data Search and Download](#)

Search and download GMD device data

[GMD Magnetometers and GIC Monitors](#)

View GMD devices such as magnetometers and GIC monitors

Menu

GMD Data Search and Download

Search and download GMD device data

GMD Magnetometers and GIC Monitors

View GMD devices such as magnetometers and GIC monitors

GMD Magnetometers and GIC Monitors

The list of available GIC Monitor and Magnetometer devices provided below may be exported.

GIC Monitors **Magnetometers** 1

2 **Export**

DeviceID	Status	Latitude North	Longitude West	Installation Type	Connection	Minimum Value In Measurement Range
10051	AV	44.40	96.50	1 - Separate	1 - Common neutral of a 3-phase transformer	0.10
10052	AV	44.90	97.00	1 - Separate	1 - Common neutral of a 3-phase transformer	0.10
10056	IV	44.80	88.20	1 - Separate	1 - Common neutral of a 3-phase transformer	0.01
10063	AV	33.40	112.50	1 - Separate	2 - Common neutral of three (3) single-phase transformers	0.10
10064	AV	41.80	88.20	2 - Combined	1 - Common neutral of a 3-phase transformer	0.10
10065	AV	41.80	87.80	2 - Combined	1 - Common neutral of a 3-phase transformer	0.10
10066	AV	41.60	87.90	2 - Combined	1 - Common neutral of a 3-phase transformer	0.10

- The Device Lists displays all GIC Monitors and Magnetometers within the GMD Portal
 1. The user can toggle back and forth between the GIC Monitors and Magnetometers
 - a. The Device Lists contain limited characteristics
 2. The user has the ability to export all GIC Monitors and/or Magnetometers from each view

- Export event data
 - Specify criteria such as location parameters and device IDs
- Data package includes:
 - Compressed event data fields by device ID
 - List of devices included in the data package
 - Missing Data/Data Quality reports for devices in the data package

Menu

[GMD Data Search and Download](#)

Search and download GMD device data

[GMD Magnetometers and GIC Monitors](#)

View GMD devices such as magnetometers and GIC monitors

Event 1
2021E01 (05/12/2021 00:00:00 - 05/13/2021 1:00:00) ▼

Device Type 3
 Magnetometers GIC Monitors

Device ID 4a
 [Add](#)

Min Latitude 2 **Max Latitude**

Min Longitude **Max Longitude**

[Clear](#) [Search](#)

Selected Devices 4b
No devices selected

Device ID 4a
 [Add](#)

Selected Devices 4b

10105	Remove
50103	Remove







1. The user must specify an event for the data download (required)
2. The user may enter a location range using the latitude and longitude filters
3. The user may specify device type (GIC Monitor and/or Magnetometer)
4. The user may enter specific Device IDs
 - a. The user may specify GIC Monitors and/or Magnetometers
 - b. If the user specifies any Device IDs, they will be added to the “Selected Devices” list
 - If no Device IDs are selected, all devices that meet any other specified criteria will be included in the data download package

4	1				2		3			1	2	3
<input type="checkbox"/>	Event Name	NCR	Device Type	Device ID	Number of Data Records	Latitude	Longitude	Data Sample Start Date and Time	Data Sample End Date and Time	Missing Data / Data Quality Report	Created On	Modified On
<input type="checkbox"/>	2013E01		GIC Monitor	10385	8641	41.20	73.80	05/31/2013 15:00:00	06/01/2013 15:00:00	Yes	06/21/2021 18:20:19	
<input type="checkbox"/>	2013E01		GIC Monitor	10083	8634	40.80	88.60	05/31/2013 15:00:00	06/01/2013 15:00:00	Yes	06/25/2021 16:30:07	
<input type="checkbox"/>	2013E01		Magnetometer	50100	1441	30.40	89.60	05/31/2013 15:00:00	06/01/2013 15:00:00	No	04/22/2021 09:55:06	
<input type="checkbox"/>	2013E01		Magnetometer	50112	1438	48.30	117.10	05/31/2013 15:00:00	06/01/2013 15:00:00	No	06/16/2021 18:35:05	
<input type="checkbox"/>	2013E01		GIC Monitor	10121	289	46.90	119.90	05/31/2013 15:00:00	06/01/2013 15:00:00	No	02/19/2021 14:15:03	06/16/2021 12:45:08

Download Selected Files 

5

- Once the search is executed, all results will be displayed below the search criteria:
 1. The number of records for each device that meets the specified criteria
 2. The start/end date/time for each device included
 3. Whether a Missing Data Report is included for each device
 4. The results allow the user to check the box of any/all device data files to download
 5. When the user clicks “Download Selected Files,” the download for all of the selected data packages begins

Name	Type
1  2021E01_10443_05122021_120000_05122021_121000	Compressed (zipped) Fol...
 2021E01_50128_05122021_120000_05122021_120000	Compressed (zipped) Fol...
 gic_monitor_missing_data_data_quality_reports_2021E01 2a	Microsoft Excel Comma S...
 gic_monitors 3a	Microsoft Excel Comma S...
 magnetometer_missing_data_data_quality_reports_2021E01 2b	Microsoft Excel Comma S...
 magnetometers 3b	Microsoft Excel Comma S...

	A	B	C
1	GICDeviceID	SampleDateTime	GICMeasured
2	10443	2013-05-12 12:00:00	1
3	10443	2013-05-12 12:01:00	2
4	10443	2013-05-12 12:02:00	3
5	10443	2013-05-12 12:03:00	4
6	10443	2013-05-12 12:04:00	5
7	10443	2013-05-12 12:05:00	6
8			

- The system will provide the user with a zip file with the following information:
 1. All event device data files associated with all selected GIC Monitors and Magnetometers
 2. Any GIC Monitor and Magnetometer Missing Data Reports associated with the selected device data files
 3. Device characteristic lists of GIC Monitors and Magnetometers that were selected

A stylized map of North America is centered on the page. The map is divided into three horizontal color bands: a light purple band at the top, a dark blue band in the middle, and a light grey band at the bottom. The word "Discussion" is written in white, bold, sans-serif font across the dark blue band, which covers the United States and parts of Canada. The word "Discussion" is positioned in the center of the map, roughly over the United States.

Discussion