IceBridge CMG 1A Dynamic Gravity Meter Time-Tagged L1B Vertical Accelerations, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Blankenship, D. D., S. D. Kempf, and D. A. Young. 2013, 2014. *IceBridge CMG 1A Dynamic Gravity Meter Time-Tagged L1B Vertical Accelerations, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/KDNRYQC7V2CD. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/IGCMG1B

National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

1.1 Format

The data files are in space-delimited ASCII text format. Each data file is paired with an associated XML file. XML files contain file granule and date and time range metadata.

1.2 File and Directory Structure

Data files are organized in folders by date, for example /2013.01.15/, and are available in the https://n5eil01u.ecs.nsidc.org/ICEBRIDGE/IGCMG1B.001/ directory.

1.3 File Naming Convention

The ASCII text files are named according to the following convention and as described in Table 1:

IGCMG1B_2012339_ICP5_JKB2h_F16T04a_accel.txt
IGCMG1B_2012339_ICP5_JKB2h_F16T04a_accel.txt.xml
IGCMG1B_YYYYDOY_PPP_JKB2h_ANNAa_accel.xxx

Table 1. Naming Convention

Variable	Description
IGCMG1B	Short name for IceBridge CMG 1A Dynamic Gravity Meter Time-Tagged Level-1B Vertical Accelerations
YYYY	Four-digit year of survey
DOY	Day of year of survey
PPP	Geographic area (Project)
JKB2h	Host platform for timing (System)
TTTT	Transect name within Project
accel	Acceleration
xxx	Indicates ASCII text file .txt, or XML file .xml

1.4 File Size

File sizes range from approximately 223 KB to 45 MB.

1.5 Volume

The entire data set is approximately 737 MB.

1.6 Spatial Coverage

Spatial coverage for this data set is Antarctica, represented by this extent:

Southernmost Latitude: 90° S
Northernmost Latitude: 53° S
Westernmost Longitude: 180° W
Easternmost Longitude: 180° E

1.6.1 Spatial Resolution

N/A

1.6.2 Projection and Grid Description

WGS 84

1.7 Temporal Coverage

These data were collected from 14 November 2012 to 15 January 2013 as part of ICECAP, NSF, NERC, and Operation IceBridge funded campaigns.

1.7.1 Temporal Resolution

IceBridge campaigns are conducted annually. Arctic and Greenland campaigns are conducted during March, April, and May, and Antarctic campaigns are conducted during October and November. Campaigns for this data set typically extend from November to early January.

1.8 Parameter or Variable

1.8.1 Parameter Description

The gravimetry files contain the fields described in Table 2.

Table 2. File Parameter Description

Parameter	Units
Year	UTC
Day of Year	UTC
Second of day	UTC
Packet sequence number	n/a
Longitude	Decimal degrees WGS-84
Latitude	Decimal degrees WGS-84
Aircraft elevation at CG antenna	Meters WGS-84
Roll, right wing down positive	Degrees
Pitch, nose up positive	Degrees
Heading, w.r.t north	Degrees
Z-axis apparent acceleration recorded on fine +/- 0.5G channel	milligals - 2 second aperiodic filter
Z-axis apparent acceleration recorded on coarse +/- 1.9G channel	milligals - 2 second aperiodic filter
X-axis apparent acceleration milligals	milligals
Y-axis apparent acceleration milligals	milligals
Normalized temperature	C
Cross coupling term: Y-horizontal acceleration * X-platform tilt	milligals
Cross coupling term: X-horizontal acceleration * Y-platform tilt	milligals
RMS of proof mass vertical displacement	nanometers
Vertical accelerometer saturation indicator counts	counts

1.8.2 Sample Data Record

The following figure shows the first 10 records from the IGCMG1B_2012339_SCT_JKB2h_Y46a_accel.txt date file.

```
2012 339 597.1190 1 115.442521 -66.739164 829.83 1.12 1.80 122.92 974032.00 974820.00
3211.40 34733.00 0.003 0.027410 0.004781 217.3 0
2012 339 597.1723 2 115.442599 -66.739184 829.84 1.17 1.80 122.97 974231.17 975019.12
3118.50 33900.00 0.003 0.027410 0.004781 217.3 0
2012 339 597.2257 3 115.442677 -66.739204 829.86 1.20 1.77 123.00 973505.00 974294.00
2795.00 33295.00 0.002 -0.007370 -0.000986 215.4 0
2012 339 597.2790 4 115.442754 -66.739223 829.87 1.20 1.72 123.00 973754.01 974542.20
2563.50 33522.00 0.002 -0.007370 -0.000986 215.4 0
2012 339 597.3324 5 115.442832 -66.739243 829.88 1.20 1.70 123.00 973150.00 973938.00
2949.30 33098.00 0.001 -0.031280 -0.010540 214.5 0
2012 339 597.3857 6 115.442910 -66.739263 829.89 1.20 1.70 123.00 973351.77 974140.79
2996.60 32988.00 0.001 -0.031280 -0.010540 214.5 0
2012 339 597.4390 7 115.442988 -66.739282 829.90 1.24 1.70 123.00 972930.00 973718.00
1962.20 33119.00 0.002 -0.039530 -0.013750 217.3 0
2012 339 597.4923 8 115.443066 -66.739302 829.91 1.29 1.70 123.00 973318.70 974107.97
2163.30 31759.00 0.002 -0.039530 -0.013750 217.3 0
2012 339 597.5457 9 115.443144 -66.739321 829.91 1.30 1.70 123.05 972821.00 973610.00
3328.70 38076.00 0.002 -0.041830 -0.013740 217.5 0
2012 339 597.5990 10 115.443222 -66.739341 829.92 1.30 1.70 123.10 972871.04 973658.91
2322.10 34992.00 0.002 -0.041830 -0.013740 217.5 0
```

Figure 1. Sample Data Record (IGCMG1B_2012339_SCT_JKB2h_Y46a_accel.txt)

2 SOFTWARE AND TOOLS

2.1 Software and Tools

No special tools are required to access ASCII text files.

2.2 Quality Assessment

These data are raw instrument outputs and as such their quality is not quantifiable in geophysical units but in physical units of the instrument detectors and internal processing which are not published by the vendor.

3 DATA ACQUISITION AND PROCESSING

3.1 Theory of Measurements

These data are raw outputs from the instrument, consisting of accelerations measured by on-board accelerometers and angles measured by on-board gyroscopes and angle encoders.

3.2 Data Acquisition Methods

These data were obtained through execution of the recommended vendor procedures for its operation. The instrument records data internally for post-flight download. The instrument requires external 4 channel (4 antennas) GPS data in real time, which was provided.

3.3 Derivation Techniques and Algorithms

Techniques as directed in vendor supplied operating instructions for the instrument.

3.3.1 Trajectory and Attitude Data

Trajectory and attitude data from GPS and internal angle encoders are as recorded in the data packets.

3.3.2 Processing Steps

To create these files the raw instrument data were interpreted from native binary to ASCII format and GPS positions were appended to the time tagged data packets.

3.3.3 Version History

On 27 May 2014, the original Version 01 data were replaced with Version 01.1. Version 01.1 data files contain header information including campaign, location, platform, and instrument metadata. The data file names were changed to include the data set short name and .txt extension. New campaigns were added. Campaigns were added, extending the temporal coverage.

3.3.4 Errors and Limitations

Instrumental errors: the gravity instrumentation must be stabilized in temperature over a period of time related to the length of time it has been off and uncontrolled. For these data, the instrument was well stabilized.

Environmental conditions: the precise accelerations and attitudes recorded by the gravimeter are subject to degradation by aircraft maneuvering, turbulence and shocks, and to a lesser extent by smooth changes in altitude and turns. The best results are from smooth, straight, level flight as can be determined by examination of the GPS trajectory data and instrument records of accelerometer saturation events.

3.4 Sensor or Instrument Description

These L1B vertical accelerations data were collected using a GT-1A Airborne Gravimeter developed by Gravimetric Technologies and Canadian Micro Gravity.

The GT-1A system is a three axis stabilized gravimeter, with a ±500 Gal dynamic range primary vertical accelerometer. Accelerations are sampled on board at 300 Hz. These are averaged over 16 sample intervals, for an effective sample rate of 18.75 Hz. The system has demonstrated accuracy on the order of 0.5 milligal in airborne surveys with spatial resolutions of a few km.

The data in this set were collected using developmental software in the unit for operations in polar regions. This modification allowed for heading control of the platform via real time input of 4 channel (4 antennas) GPS data.

Positions (Fields 5-10) are interpolated from the real time GPS feed and have an accuracy of several meters. They should NOT be used for primary data analysis.

4 REFERENCES AND RELATED PUBLICATIONS

Vendor Instrument Description

GT-1A Airborne Gravimeter

Vendor Technology Description

http://www.canadianmicrogravity.com/index.php?option=com_content&view=article&id=114&Itemid=108

4.1 Related Data Collections

- IceBridge BGM-3 Gravimeter L0 Raw Accelerations
- IceBridge BGM-3 Gravimeter L1B Time-Tagged Accelerations
- IceBridge BGM-3 Gravimeter L2 Geolocated Free Air Anomalies
- IceBridge ZLS Dynamic Gravity Meter Time-Registered L1B Vertical Accelerations

4.2 Related Websites

- IceBridge Product Web Site
- IceBridge Web site at NASA
- ICESat/GLAS Web site at NASA Wallops Flight Facility
- ICESat/GLAS Web site at NSIDC
- University of Texas Institute for Geophysics Web site

5 CONTACTS AND ACKNOWLEDGMENTS

5.1 Contacts

Donald D. Blankenship, Scott Kempf, Duncan Young

University of Texas at Austin

Institute for Geophysics

Austin, TX, 78759-8500

5.2 Acknowledgments

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- Jackson School of Geosciences

6 DOCUMENT INFORMATION

6.1 Publication Date

31 October 2013

6.2 Date Last Updated

22 May 2014