



IceBridge Riegl Laser Altimeter L2 Geolocated Surface Elevation Triplets, Version 1

USER GUIDE

How to Cite These Data

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

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

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/ILUTP2>



National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 File Information

1.1.1 Format

The data files are in space-delimited ASCII text format. Each data file is paired with an associated XML file, which contains additional metadata.

1.1.2 File Naming Convention

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

File name examples:

ILUTP2_2013022_ICP5_JKB2h_F26T04a_srfelv.txt

ILUTP2_2013022_ICP5_JKB2h_F26T04a_srfelv.txt.xml

ILUTP2_YYYYDOY_AAAN_JKBna_Xnna_srfelv.xxx

Table 1. File Naming Convention

Variable	Description
ILUTP2	Data set ID
YYYY	Four-digit year of survey
DOY	Day of year of survey
AAAN	Geographic area
JKBna	Host platform
Xnna	Geographic track line
srfelv	Surface range
xxx	Indicates ASCII text file (.txt), or or XML file (.xml)

1.2 Spatial Information

1.2.1 Coverage

Spatial coverage for the Riegl Laser Altimeter data includes Greenland and Antarctica. This represents the coverage noted below.

Greenland:

Southernmost Latitude 59° N

Northernmost Latitude: 83° N

Westernmost Longitude: 74° W

Easternmost Longitude: 12° W

Antarctica:

Southernmost Latitude: 90° S

Northernmost Latitude: 53° S

Westernmost Longitude: 180° W

Easternmost Longitude: 180° E

Figure one shows spatial coverages for Antarctica by campaign year.

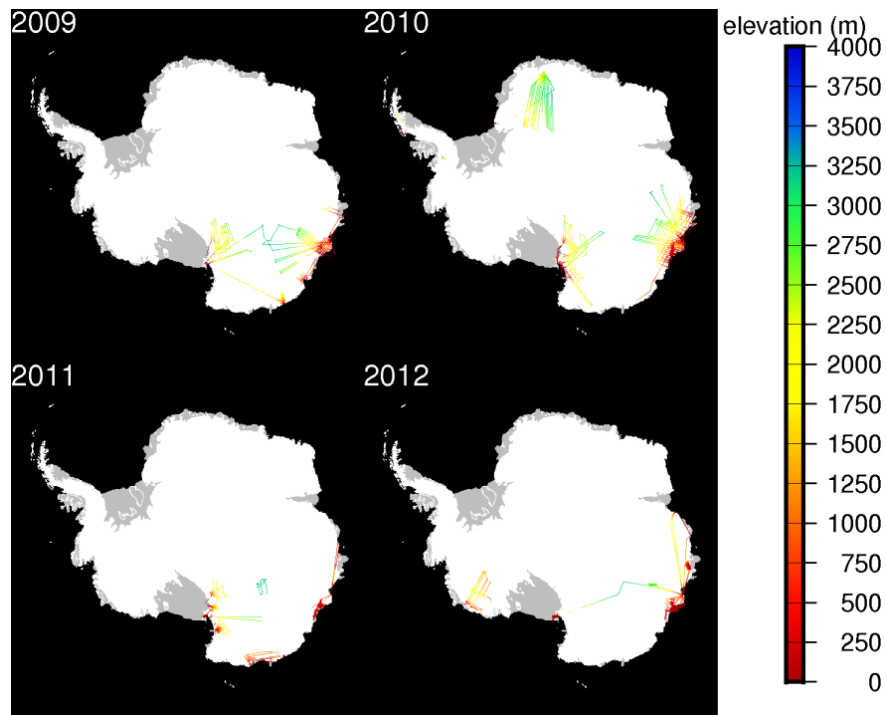


Figure 1. Antarctic Temporal and Spatial Coverage

1.2.2 Resolution

The effective footprint of the laser data is 25 m along track by 1 meter across track.

1.2.3 Projection and Grid Description

Referenced to WGS-84 Ellipsoid, ITRF-2008.

1.3 Temporal Coverage

29 December 2008 to 22 January 2013

1.3.1 Temporal Resolution

IceBridge campaigns are conducted on an annual repeating basis. Arctic and Greenland campaigns are typically conducted during March, April, and May; Antarctic campaigns are typically conducted between October and February.

1.4 Parameter or Variable

1.4.1 Parameter Description

The Riegl Laser Altimeter L2 files contain fields as described in Table 2.

Table 2. Parameter Description

Parameter	Units
Year	UTC
Day of Year	UTC
Second of day	UTC
Longitude Angle, WGS-84	Degrees
Latitude Angle, WGS-84	Degrees
Laser Derived Surface Range (WGS-84, ITRF2005)	Meters

Missing values have been replaced by NANs.

Horizontal positions represent aircraft location at the time of the observation.

1.4.2 Sample Data Record

Shown below are the first ten data records from the data file: ILUTP2_2013013_ICP5_JKB2h_F20T01a_srfe1v.txt

```
2013 13 85463.8042 166.949721 -77.908312 -43.37
2013 13 85464.0757 166.950227 -77.908193 -43.36
2013 13 85464.3477 166.950755 -77.908079 -43.36
2013 13 85464.6182 166.951274 -77.907961 -43.34
2013 13 85464.8891 166.951777 -77.907838 -43.34
2013 13 85465.1608 166.952284 -77.907717 -43.30
2013 13 85465.4313 166.952796 -77.907599 -43.35
2013 13 85465.7019 166.953324 -77.907486 -43.34
2013 13 85465.9723 166.953872 -77.907377 -43.36
2013 13 85466.2428 166.954448 -77.907271 -43.41
```

Figure 2. Sample from the data file: ILUTP2_2013013_ICP5_JKB2h_F20T01a_srfe1v.txt

2 DATA ACQUISITION AND PROCESSING

2.1 Trajectory and Attitude Data

Except for the 2010 field season, trajectory information was derived using Waypoint Inertial Explorer loosely coupled PPP/IMU processing. See the IceBridge GPS/IMU L1B Primary Position and Attitude Solution data set and Young et al. (2014) for details.

2.2 Processing Steps

Cloud filtering was performed by passing only continuous sections 20 meters long, with jumps between samples of 2 meters rejected. Ranges of less than 150 meters were also rejected. Default ranges where a surface was not detected by the laser ranger were -1 meters. Range vectors were transformed into elevations through the vector algebra reviewed in Koks (2008).

2.3 Quality, Errors, and Limitations

The primary sources of errors are:

- the pointing biases, in particular a coupling between the pitch bias and the range bias
- the limitation on the along track resolution, especially in rough areas
- interflight biases due to unmodelled tropospheric delays in the PPP GPS solutions

The net error is approximately 12 cm.

2.4 Instrumentation

2.4.1 Description

The instrument has been used and validated in previous field campaigns (Young et al., 2014). The instrument is a Riegl LD90-3800-HiP-LR distance meter, with a 3.5 mW diode laser operating at 905 nm. The Laser Altimeter System (LAS) acquires measurements at 2000 Hz, with a range resolution of 2 mm and ground spot width of approximately 1 m. For each block of 575 pulses, the greatest range is recorded, along with the standard deviation and maximum amplitude of the detected pulse echoes. Samples were time stamped using a 100 kHz counter timer, along with a precise timing signal from GPS clock. Typical point separation on the ground was 21–23 m, as expected for a target ground speed of 90 m-s⁻¹. The maximum range of the system is 1500 m over ice.

3 SOFTWARE AND TOOLS

No special tools are required for the ASCII text files.

4 VERSION HISTORY

On 05 July 2013, the Version 1 2009, 2010, and 2011 Antarctica data were replaced by Version 1.1. Version 1.1 data files were revised in the Seconds field and the Laser Derived Surface field.

5 RELATED DATA SETS

- [IceBridge Riegl Laser Altimeter L0 Raw Ranges](#)
- [IceBridge Riegl Laser Altimeter L1B Time-Tagged Laser Ranges](#)
- [Airborne Laser Altimetry of the Thwaites Glacier Catchment, West Antarctica](#)

6 RELATED WEBSITES

- [IceBridge Product Website](#)
- [IceBridge Website at NASA](#)
- [ICESat/GLAS Website at NASA Wallops Flight Facility](#)
- [ICESat/GLAS Website at NSIDC](#)
- [University of Texas Institute for Geophysics Website](#)

7 CONTACTS AND ACKNOWLEDGMENTS

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Embedded GPS/INS (EGI) Inertial Navigation System (INS) used in the 2010-2011 field season. See Support: Funding: and Institutions: fields in granules for specific information for each file.

8 REFERENCES

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9 DOCUMENT INFORMATION

9.1 Publication Date

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9.2 Date Last Updated

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