



IceBridge UAF Lidar Profiler L1B 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:

Larsen, C. 2010. *IceBridge UAF Lidar Profiler L1B Geolocated Surface Elevation Triplets, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/2I5C7MQ2K6V1>. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT <https://nsidc.org/data/ILAKP1B>



National Snow and Ice Data Center

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1 DETAILED DATA DESCRIPTION

1.1 Format

The UAF Lidar Profiler Level-1B Geolocated Surface Elevation Triplets data files are in LAS 1.2 sequential binary format. The LAS file format is a public file format for the interchange of 3-dimensional point cloud data between data users. See [ASPRS Standards Committee LASer \(LAS\) File Format Exchange Activities](#).

1.2 File Naming Convention

The data files are named according to the following convention and as described in Table 2:

ILAKP1B_YYYY_DOY_Aaaa.nnn

Example:

ILAKP1B_2009_153_Fairweather.las

ILAKP1B_2009_153_Fairweather.las.xml

Where:

Table 1. File Naming Convention

Variable	Description
ILAKP1B	Short name for IceBridge UAF Lidar Profiler L1B Geolocated Surface Elevation Triplets
YYYY	Four-digit year of data collection
DOY	Day of Year of acquisition
Aaaa	Glacier name
nnn	indicates file format, LAS (.las) or XML (.xml)

1.3 Spatial Coverage

Spatial coverage for the IceBridge UAF Lidar Profiler Level-1B Geolocated Surface Elevation Triplets campaigns:

Southernmost Latitude: 56.95° N

Northernmost Latitude: 59.30° N

Westernmost Longitude: 137.53° W

Easternmost Longitude: 132.33° W

1.3.1 Spatial Resolution

The footprint on the ground of the laser shot points is on the order of 20 cm in diameter. Average spacing along path is roughly 1.2 meters, subject to Height Above Ground (HAG) flown and attitude of the aircraft. Preferred HAG is 500 to 600 m.

1.3.2 Projection and Grid Description

The data are provided with Universal Transverse Mercator (UTM) eastings and northings. Easting and northing values are in UTM zones 6, 7, and 8. Geoid values are not included.

1.4 Temporal Coverage

These data were collected as part of NASA Operation IceBridge funded campaigns from 22 May 2009 to 02 June 2009.

1.4.1 Temporal Resolution

IceBridge campaigns are conducted on an annual repeating basis. Alaska campaigns are conducted during May, June, July, August, and September.

The data points along the flight path are collected from a profiling laser at a rate of 20 Hz.

1.5 Parameter or Variable

The UAF Lidar Profiler Level-1B Geolocated Surface Elevation Triplets data set contains elevation measurements with UTM easting and northing.

1.5.1 Parameter Description

Parameters contained in UAF Lidar Scanner Level-1B data files are described in Table 2. Column numbers 1 to 3 in Table 2 represent columns left to right in the data. Columns are not numbered in the data files.

Table 2. Parameter Description and Units

Column	Description	Units
1	UTM Easting	Meters
2	UTM Northing	Meters
3	Elevation (Height Above Ellipsoid (HAE))	Meters

1.5.2 Sample Data Record

Below is an ASCII format excerpt of the ILAKP1B_2009_153_A1sek.las data file converted from the binary. The three fields in each record correspond to the columns described in Table 2.

```
339303.82087934745 6566614.6654413603 1476.2300000041726
339306.23495620355 6566614.9672009675 1476.6826394146899
339308.6490330596 6566615.4198403778 1476.9843990217016
339311.0631099157 6566615.872479788 1476.9843990217016
339313.47718677181 6566616.1742393952 1477.1352788252075
339315.89126362791 6566616.6268788055 1477.437038432219
339318.45622028748 6566616.9286384126 1477.437038432219
```

Figure 1. Sample Data Record

2 SOFTWARE AND TOOLS

LAS files can be opened using tools available from the [ASPRS Lidar Data Translation Toolset](#) website. See also the [LAStools](#) web page for various tools for converting, filtering, viewing, processing, and compressing LAS format lidar data.

3 DATA ACQUISITION AND PROCESSING

The UAF altimetry data are comprised of a series of point measurements on the surface of glaciers recorded from an aircraft. Each point is derived from a pulsed laser range measurement combined with aircraft Global Positioning System Inertial Measurement Unit (GPS/IMU) positioning and orientation measurements. The footprint on the ground of the laser shot points is on the order of 20 cm in diameter. Coordinates and elevation for each point are referenced in the International Terrestrial Reference Frame (ITRF00) and are accurate to within +/- 30 cm. Longitude/latitude values are derived by projecting the ITRF coordinates into WGS 84. Easting and northing values are in UTM zones 6, 7, and 8. All vertical data are in HAE.

A profile transect of points along the flight path is collected from the laser system at a pulse rate of 20 Hz. Average spacing along path is roughly 1.2 meters, subject to HAG flown and wind, turbulence, and maneuvering. Preferred HAG is 500 to 600 m.

3.1 Data Acquisition Methods

The GPS records the position of the aircraft every second as it flies over a glacier. The laser continually measures the distance between the aircraft and the glacier surface, and the gyroscope measures the direction the laser is pointing.

3.2 Derivation Techniques and Algorithms

3.2.1 Processing Steps

The following processing steps are performed by the data provider.

1. All GPS processing of the aircraft position uses L1 frequency 1575.42 MHz and L2 frequency 1227.6 MHz data recorded at 5 Hz, processed with the TRACK GPS differential phase kinematic positioning program, a module of the GAMIT/GLOBK software programs from the [Department of Earth Atmospheric and Planetary Sciences, MIT](#). For further information on TRACK, see http://geoweb.mit.edu/~tah/track_example.
2. GPS base station coordinates are found using Online Positioning User Service (OPUS). For further information on OPUS, see <http://www.ngs.noaa.gov/OPUS/>. The kinematic processing and the laser shot point coordinates are referenced to these base station coordinates.

3.3 Sensor or Instrument Description

The UAF lidar profiler is used for measuring surface elevation changes of glaciers throughout Alaska and western Canada. The system consists of a highly accurate GPS receiver, a laser profiler, and a gyroscope. Combining data from these instruments, elevation profiles of the surface of the glacier are created that are accurate to better than half a meter.

4 REFERENCES AND RELATED PUBLICATIONS

Text goes here

4.1 Related Data Collections

- [IceBridge UAF Lidar Scanner L1B Geolocated Surface Elevation Triplets](#)
- [IceBridge UAF GPS/IMU L1B Corrected Position and Attitude Data](#)

4.2 Related Websites

- [GAMIT-GLOBK, MIT Department of Earth Atmospheric and Planetary Sciences](#)
- [IceBridge Data Web site at NSIDC](#)
- [IceBridge Web site at NASA](#)
- [ICESat/GLAS Web site at NASA Wallops Flight Facility](#)
- [ICESat/GLAS Web site at NSIDC](#)
- [NOAA OPUS: Online Positioning User Service](#)
- [UAF Glacier Lidar System Web page](#)

5 CONTACTS AND ACKNOWLEDGMENTS

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6 DOCUMENT INFORMATION

6.1 Publication Date

14 February 2017

6.2 Date Last Updated

5 October 2020