SnowEx23 Oct22 Ground Surface Roughness Reconstruction, Version 1

USER GUIDE

How to Cite These Data

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

Meyer, J. 2024. *SnowEx23 Oct22 Ground Surface Roughness Reconstruction, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/KCXOEYAY6PA9. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/SNEX23_OCT22_GSR

National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 Summary

This data set presents ground surface roughness data collected during the NASA SnowEx 2023 field campaign between 23 and 25 October 2022. The data are formatted as point clouds, compiled from images acquired using a digital camera. Images were collected from 13 snow pits located at the Upper Kuparuk and Toolik (UKT) study site, an arctic tundra environment in Northern Alaska. The raw imagery from which these data are derived are available as SnowEx23 Oct22 Ground Surface Roughness Imagery, Version 1.

1.2 File Information

1.2.1 Format

Data are provided as `.laz` (LIDAR Aerial Survey zip) files.

1.2.2 Naming Convention

Data files utilize the following naming convention which is described in Table 1.

`SNEX23_OCT22_GSR_UKT_[pit_ID]_[YYYYMMDD]_LUMIX_V01.0.laz`

Table 1. File naming convention

Variable	Description
`SNEX23`	SnowEx 2023 field campaign
`OCT22`	Month and year of data collection
`GSR`	Ground Surface Roughness
`UKT`	Study site: Upper Kuparuk and Toolik
`[pit_ID]`	Snow pit ID
`[YYYYMMDD]`	Date images was taken, formatted as 4-digit year, two-digit month, and two-digit day
`Lumix`	Camera type used
`v<nn.n>`	Indicates version number of the data set
`.laz`	File extension: LIDAR Aerial Survey zip files

1.3 Spatial Information

1.3.1 Coverage

Northernmost Latitude: 68.70° N

Southernmost Latitude: 68.40° N

Easternmost Longitude: 149.30° W

Westernmost Longitude: 149.50° W

1.3.2 Resolution

Varies

Note: The point cloud files are not geolocated. Geographic coordinates have been assigned to each file, based on a point measurement representative of each snow pit location.

1.3.3 Geolocation

Table 2. Geolocation Details

Geographic coordinate system	WGS 84
Longitude of true origin	Prime Meridian, Greenwich
Datum	World Geodetic System 1984
Ellipsoid/spheroid	WGS 84
Units	Degrees
EPSG code	4326
PROJ4 string	+proj=longlat +datum=WGS84 +no_defs +type=crs
Reference	https://epsg.org/crs_4326/WGS-84.html

1.4 Temporal Information

1.4.1 Coverage

23 Oct 2022 to 25 Oct 2022

1.4.2 Resolution

Varies

2 DATA ACQUISITION AND PROCESSING

2.1 Background

This data set presents ground surface roughness data produced using digital photographs taken of snow pits dug as part of the NASA SnowEx23 Alaska field campaign during October 2022. Photogrammetric methods were used to derive the data, which are formatted as point clouds. Each point cloud file is representative of the ground surface of a single snow pit.

2.2 Acquisition

At each snow pit, photogrammetry markers were arranged as shown in Figure 1. Three makers were positioned on the eastern, western, and northern sides of each pit, and one marker was positioned in the pit center, such that the reference strip on the marker was oriented north to south.

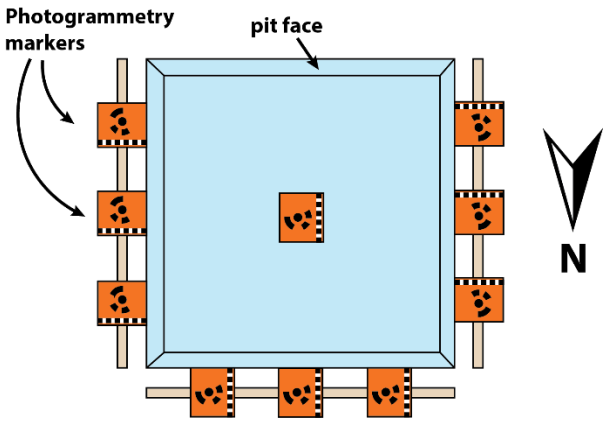

Figure 1. Schematic of snow pit viewed from above, showing placement of photogrammetry markers.

A series of overlapping images of each pit were taken using a Panasonic Lumix DC-TS.7 digital camera. The camera was set to P (Program Mode), with a max ISO (e.g., light sensitivity) of 200, and a 34 mm zoom. The zoom setting was chosen to reduce distortion of the image edge. Photos were taken oriented directly above the pit, with the camera facing downward, as illustrated in Figure 2.

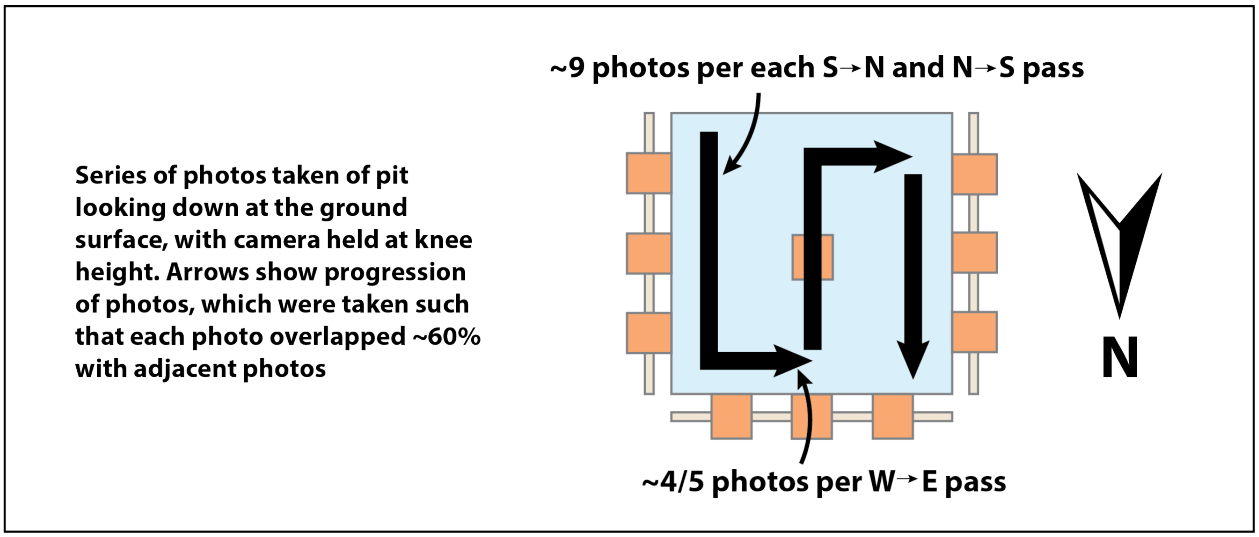

Figure 2. Schematic showing the orientation and progression of photographs in relation to the snow pit, as viewed from above.

2.3 Processing

To create each point cloud, each set of photographs was processed using Agisoft Metashape. The processing workflow is available on GitHub (Meyer, 2024).

A processing report is available for each data file, which includes image and camera specifications, processing parameters, and the following figures:

- a static image of the point cloud
- a figure demonstrating camera locations and image overlaps
- a figure of the image residuals
- a static image of the reconstructed digital elevation mode (DEM) for each snow pit

These processing reports are compiled into a single technical reference available here.

2.4 Quality, Errors, and Limitations

The provided processing reports (linked above) present quality and error information for each data file, including image calibration coefficients and reprojection errors.

3 VERSION HISTORY

Table 3. Version History

Version	Date Implemented	Impacted Temporal Coverage	Description of Changes
v01.0	January 2025	23 Oct 2022 to 25 Oct 2022	Initial release

4 RELATED DATA SETS

SnowEx23 Oct22 Ground Surface Roughness Imagery, Version 1

SnowEx23 Oct23 Ground Surface Roughness Reconstruction, Version 1

SnowEx23 Oct23 Ground Surface Roughness Imagery, Version 1

SnowEx at NSIDC | Data sets

5 RELATED WEBSITES

SnowEx at NSIDC | Overview

SnowEx at NASA

6 REFERENCES

Meyer, J. (2024). SnowEx/GSR2: 20240412 (Version 20240412). Zenodo.
https://doi.org/10.5281/zenodo.10967251

7 DOCUMENT INFORMATION

7.1 Publication Date

January 2025

7.2 Date Last Updated

January 2025