SnowEx17 Time-Lapse Imagery, Version 1

USER GUIDE

How to Cite These Data

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

Raleigh, M. S., W. R. Currier, J. D. Lundquist, P. Houser and C. Hiemstra. 2022. *SnowEx17 Time-Lapse Imagery, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/WYRNU50R9L5R. [Date Accessed].

National Snow and Ice Data Center

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1   DATA DESCRIPTION

1.1 Parameters

This data set contains time-lapse images collected by cameras placed around Grand Mesa, CO at 34 sites and around Senator Beck Basin, CO at one site, coincident with other SnowEx 2017 measurements.

1.2 File Information

1.2.1   Format

All images for an individual camera location are collected within a tar.gz compressed file. Images are available as Joint Photographic Experts Group (.jpg) files.

1.2.2   Naming Convention

Data files utilize the following naming convention:

SnowEx17_TLI_[camera_name].tar.gz

Table 1. File Naming Convention

Variable	Description
SnowEx17_TLI	Short name for SnowEx17 Time-Lapse Imagery
camera_name	All camera names are listed together with their location information in Table 2.
.tar.gz	File name ending referring to compression type.

An example for a sample file is shown below:

SNEX17_TLI_TLS-A1N.tar.gz

All camera names and their location during the SnowEx17 campaign are listed in the table below. For additional information see the SnowEx17 CRREL Differential GNSS Survey landing page.

Table 2. Camera Names and Locations. Coordinates and elevations were provided either by differential GNSS, a handheld Garmin GPS unit, or estimated on Google Earth.

Camera Name	Easting	Northing	Elevation (m)	Survey
TLS-A1N	221601.5	4325299.93	3033.72	Diff. GNSS
TLS-A2S	221680.32	4325316.21	3041.62	Diff. GNSS
TLS-A3E	221658.53	4325368.37	3030.7	Diff. GNSS

Camera Name	Easting	Northing	Elevation (m)	Survey
TLS-D1E	224490.64	4322677.34	3045.84	Diff. GNSS
TLS-D2E	224537.37	4322646.49	3049.99	Diff. GNSS
TLS-D3W	224529.07	4322646.58	3047.94	Diff. GNSS
TLS-F1W	228486.05	4322349.5	3109.96	Diff. GNSS
TLS-F2E	228415.13	4322320.17	3104.36	Diff. GNSS
TLS-F3N	228309.93	4322319.88	3100.62	Diff. GNSS
TLS-J1N	235128.32	4326927.64	3234.29	Diff. GNSS
TLS-J2N	235070.94	4327007.8	3228.51	Diff. GNSS
TLS-J3S	235069.13	4326906.24	3236.51	Diff. GNSS
TLS-K1E	235528.11	4325025.62	3255.98	Diff. GNSS
TLS-K2N	235549.41	4325003.23	3254.45	Diff. GNSS
TLS-K3N	235628.33	4325011.01	3259.83	Diff. GNSS
TLS-K4E	235622.83	4325028.5	3257.37	Diff. GNSS
TLS-K5N	235654.36	4324951.94	3254.52	Diff. GNSS
TLS-K6E	235614.22	4325004.48	3257.81	Diff. GNSS
TLS-L1W	237916.41	4324779.53	3295.01	Diff. GNSS
TLS-L2E	237716.77	4324780.57	3294.48	Diff. GNSS
TLS-N1E	246040.62	4324022.19	3054.6	Diff. GNSS
TLS-N2N	246050.92	4324004.25	3054.21	Diff. GNSS
TLS-N4W	246041.76	4323879.39	3057.73	Diff. GNSS
CG-01E	232228	4327361	2977	Garmin GPS
CG-02N	232246	4327360	2979	Garmin GPS
CG-03S	232220	4327383	2974	Garmin GPS
GMSP-CAM	235072	4326869	3239	Estimated
LSOS2	231916	4327143	2974	Estimated
LSOS-CAM	231916	4327143	2974	Estimated
LSOS-GARAGE	231842	4327190	2981	Estimated
LSOS-GARAGE2	231842	4327190	2981	Estimated
ME-CAM	250624	4332291	3054	Estimated
MM-CAM	245388	4325283	3176	Estimated
MW-CAM	221797	4325453	3033	Estimated
SASP-1	261731	4199027	3380	Garmin GPS

1.3 Spatial Information

1.3.1   Coverage

Grand Mesa cameras have the following spatial bounds:

Northernmost Latitude: 39.055° N
Southernmost Latitude: 39.007° N
Easternmost Longitude: 107.934° W
Westernmost Longitude: 108.216° W

The Senator Beck camera (SASP-1) was placed at 37.9076° N, 107.7102° W.

1.3.2   Resolution

The spatial resolution varies across each image, from sub-centimeter resolution for objects close to the camera to many meters for objects far from the camera.

1.3.3   Geolocation

All camera location coordinates lie within UTM Zone 13N. The following table provides information for geolocating this data set.

Table 3. Geolocation Details

Geographic coordinate system	WGS 84
Projected coordinate system	UTM zone 13N
Longitude of true origin	-108
Latitude of true origin	0
Scale factor at longitude of true origin	0.9996
Datum	WGS 84
Ellipsoid/spheroid	WGS 84
Units	Meters
False easting	500000
False northing	0
EPSG code	32613
PROJ4 string	+proj=utm +zone=13 +datum=WGS84 +units=m +no_defs
Reference	https://epsg.io/32613

1.4 Temporal Information

1.4.1   Coverage

The maximum temporal coverage for this data set is 27 September 2016 through 05 October 2017.

All cameras were installed in late September or early October 2016. Most were removed between May and July 2017, but one camera located at a Grand Mesa weather station (MW-CAM) was left in the field until October 2017.

1.4.2   Resolution

Images were taken approximately every one to three hours, so there are between 5 and 10 images each day.

2   DATA ACQUISITION AND PROCESSING

2.1 Background

Previous studies have used time-lapse imagery to extract information on snow properties (Parajka et al., 2012; Kerr et al., 2013; Dickerson-Lange et al., 2015), including measuring snow depth (Floyd and Weiler, 2008; Currier et al., 2017) and identifying snow-covered areas (Hinkler et al., 2002; Farinotti et al., 2010). Time-lapse imagery has also been used to evaluate remote sensing data and models (Raleigh et al., 2013; Lv and Pomeroy, 2020). Potential applications of this data set include:

- quantifying snow depth variations over time
- mapping snow-covered areas over time
- mapping snow-disappearance timing
- assessing forest and scale effects on snow cover on the ground
- mapping snow presence in forest canopies (e.g. Lumbrazo et al., in review)

2.2 Acquisition

Cameras were placed around Grand Mesa, CO at 34 sites coincident with other SnowEx 2017 measurements, including the TLS scans, sonic snow depth arrays, weather stations, and local scale observation sites. One camera (SASP-1) was also deployed near the Swamp Angel Study Plot in Senator Beck Basin, CO.

2.3 Processing

This data set contains raw images; no data processing was performed.

2.4 Quality, Errors, and Limitations

Image quality may be variable depending on local light and weather conditions at the time of each image acquisition. Condensation/frost on the camera lens may be present in some winter scenes, which will further impact image quality and usability. Image collections are limited to visible wavelengths (red, green, blue) and are therefore only useful in daytime acquisitions. Shifts in field of view may be present due to camera movement (e.g., swaying tree that was used for camera mounting).

2.5 Instrumentation

The time-lapse camera network was composed of Wingscapes brand trail/game cameras. The two deployed models were "TimeLapseCam" and "TimeLapseCam Pro". The main functional difference between the two models is a greater pixel resolution and a different image aspect ratio in the "TimeLapseCam Pro" model.

Most cameras were mounted on tree trunks with fabric straps, typically 3 m above the ground, but a few cameras were installed on metal poles.

The field view of some cameras included a 3.049 m, (10 ft) vertical pole that was painted orange to serve as a reference for quantifying snow depth.

3   VERSION HISTORY

Table 4. Version History Summary

Version	Release Date	Description of Changes
001	January 2022	Initial release

4   RELATED DATA SETS

SnowEx at NSIDC| Data Sets
SnowEx17 CRREL Differential GNSS Survey

5   RELATED WEBSITES

SnowEx at NSIDC | Overview
NASA SnowEx

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7   REFERENCES

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8   DOCUMENT INFORMATION

8.1 Publication Date

04 January 2022

8.2 Date Last Updated

04 January 2022