



NIVAL Mores Creek Summit Snow Depth, Canopy Height, and DTM from Airborne LiDAR, Version 1

USER GUIDE

How to Cite These Data

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

Van Der Wiede, T., Siobhan, C., Wadhwani, Y., Alabi, I., O'Neel, C., and H.P. Marshall. 2026. *NIVAL Mores Creek Summit Snow Depth, Canopy Height, and DTM from Airborne LiDAR, Version 1*.

[Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/DPFDH2M49DQG>. [Date Accessed].

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

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



National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 Parameters

This data set provides digital terrain models (DTM), digital surface models (DSM), snow depth (SD), and canopy height models (CHM), derived from point cloud data acquired by airborne lidar scanning over a 35 km² region of the Mores Creek Headwaters in the Boise Mountains of central Idaho. This LiDAR dataset builds upon an existing collection of monthly LiDAR surveys of the same domain that began with the NASA SnowEx field campaign in 2021 (available as [SnowEx Mores Creek Summit \(MCS\) Airborne LiDAR Survey, Version 1](#)). Data were collected between 03 December 2025 and 04 April 2026 and timed to align with the 12-day overpass interval of the NASA and Indian Space Agency Synthetic Aperture Radar ([NISAR](#)) satellite. Thus, the snow depth raster images available in this data set can be used to validate NISAR satellite data.

1.2 File Information

1.2.1 Format

The data are available as Geographic Tagged Image (GeoTIFF, 32-bit) files.

1.2.2 File Contents

Each GeoTIFF file contains embedded georeferenced data representing ground elevation (DTM), surface elevation (DSM), snow depth (SD), or canopy height (CHM) in meters.

1.2.3 Naming Convention

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

NIVAL_MCS_Lidar_YYYYMMDD_[PARAMETER]_V01.0.tif

Table 1. File Naming Convention

Variable	Description
NIVAL_MCS_Lidar	Mores Creek Summit NISAR validation lidar data
YYYYMMDD	Date of data acquisition formatted as four-digit year, two-digit month, and 2-digit day
[PARAMETER]	Data parameter: <ul style="list-style-type: none"> • DTM: digital terrain model • DSM: digital surface model • SD: snow depth • CHM: canopy height model

Variable	Description
V01.0	Data set version
tif	File extension: GeoTIFF

1.3 Spatial Information

1.3.1 Coverage

Northernmost Latitude: 43.9748

Southernmost Latitude: 43.91365

Easternmost Longitude: 115.64244

Westernmost Longitude: 115.7305

1.3.2 Resolution

The horizontal spatial resolution is 0.5 m.

1.3.3 Geolocation

This data set conforms to the WGS 84 / UTM zone 11N coordinate reference system ([EPSG 32611](#)).

1.4 Temporal Information

1.4.1 Coverage

03 December 2025 to 04 April 2026

1.4.2 Resolution

At the Mores Creek Summit latitude, NISAR has a 12-day repeat interval. Airborne lidar surveys were timed to coincide with the NISAR overpass' as closely as weather conditions allowed. A subset of the acquisitions targeted a specific storm event, and multiple flights were executed within a few days.

2 DATA ACQUISITION AND PROCESSING

2.1 Background

This data set presents snow depth and canopy height data derived from snow-on and snow-off airborne lidar data for a 35 km² region of Mores Creek Headwaters in the Boise Mountains of central Idaho. Snow-on airborne lidar scans were collected by the Remote Sensing and Geographic Information Systems Center of Expertise (RSGIS CX) at the Cold Regions Research and Engineering Laboratory (CRREL) and the Cryosphere Geophysics and Remote Sensing Group (CryoGARS) at Boise State University between December 2025 and April 2026. Lidar surveys were timed to align with overflights of the new NASA and Indian Space Agency Synthetic Aperture Radar (NISAR) satellite.

2.2 Acquisition

Each snow-on lidar data acquisition was conducted using a lidar scanner, Inertial Measurement Unit (IMU), antenna, and flight management system (FMS) attached to a Robinson R66 helicopter using a nose-mounted RaLiPod system. The helicopter was operated by Silverhawk Aviation, based out of Caldwell, Idaho and flown on behalf of Boise State University and CRREL. For each acquisition date, a typical mission consisted of the following:

1. 5 minute ground-based initialization period
2. Boresight calibration over built environment, consisting of several passes in different directions over a neighborhood.
3. Main data acquisition over survey domain as weather and fuel allow
4. 5 minute ground-based static-alignment before aircraft shutdown.

Several base stations were used during trajectory processing. The Boise State CryoGARS group operates semi-permanent stations (Pilot Peak and Treeline) consisting of Septentrio PolaRx5 receivers and Trimble Zephyr 3 antennas. These stations are owned and maintained by the Boise State CryoGARS group. Additional details regarding the base stations, their usage, and their locations can be found in the provided Technical Reference ([Boise, Idaho Airborne LiDAR Survey at Mores Creek Summit and Camas Prairie: 2025-2026 Snow Season Report](#)).

2.3 Processing

After data acquisition, the GNSS/IN data and raw laser scanner data were first processed to create point cloud data. The point cloud data was then processed using the [ice-road-copters suite](#) to derive four types of raster data: 1) digital surface models (DSM; all surface points), 2) digital terrain models (DTM; all ground points), 3) snow depth models (SD; the difference between the digital

terrain model and reference DEM), and (4) canopy height models (CHM; the difference between the digital surface model and reference DEM).

2.3.1 Laser Scanner Data Processing Steps

The following steps were performed using the Riegl RiPROCESS software suite:

1. Post-process the laser scanner data against the SBET to create a point cloud
2. Using planar features in the boresight survey, iteratively adjust sensor orientation parameters (roll, pitch, yaw) to improve the alignment between overlapping data. The orientation solution found during boresight alignment is applied to all AOI records.
3. Minimize offsets between scan data overlap using a least squares solution
4. Export the point cloud (LAZ) from the post processing software into a deliverable file format for all collection records

2.3.2 Creation of raster data using ice-road-copters

The ice-road-copter suite leverages a Point Data Abstraction Library (PDAL) and the NASA's Ames Stereo Pipeline (ASP) and was used to create the final data products listed below. A shapefile of a road that traverses the survey domain and is plowed in winter (such that change between the bare earth and snow-on flights along the road is zero) was used to co-register flights. A summary of point cloud processing via ice-road-copter can be found on the [ice-road-copters github page](#).

- 0.5 m raster data (.tif files)
 - Digital terrain model (DTM): ground points
 - Digital surface model (DSM): surface points
 - Canopy height model (CHM): found by subtracting reference map from DSM
 - Snow depth (SD): found by subtracting reference map from DTM

2.4 Quality, Errors, and Limitations

In some instances, poor weather prevented data collection over the entire study domain.

2.5 Instrumentation

Data were acquired using a REIGL VQ580ii laser scanner and an Applanix AP60 Inertial Measurement Unit. Additional instrument details for each snow season can be found in the provided Technical Reference ([Boise, Idaho Airborne LiDAR Survey at Mores Creek Summit and Camas Prairie: 2025-2026 Snow Season Report](#)).

3 REFERENCE DEM

Snow-off lidar data was acquired over the original 30 km² Mores Creek study area as part of NASA's SnowEx 2020 field campaign by Quantum Spatial (now known as NV5 Geospatial), which was contracted by Boise State University. These snow-free data were used to produce a 0.5 m resolution bare earth reference DEM, previously published within [SnowEx20-21 QSI Lidar DEM 0.5m UTM Grid, Version 1](#) as SNEX20_QSI_DEM_0.5M_USIDMC_20210917_20210917.tif. Additional details about the acquisition, processing, and quality of the lidar data used to create the reference DEM can be found in the SnowEx20-21 QSI Lidar DEM 0.5m UTM Grid, Version 1 [User Guide](#) and within a [detailed report](#) assembled by Quantum Spatial.

4 VERSION HISTORY

Table 2. Version History Summary

Version	Date Implemented	Impacted Temporal Coverage	Description of Changes
v01.0	May 2026	03 December 2025 to 04 April 2026	Initial release

5 RELATED DATA SETS

[SnowEx Mores Creek Summit \(MCS\) Airborne LiDAR Survey, Version 1](#)

[SnowEx Mores Creek Summit \(MCS\) Airborne LiDAR Survey Raw, Version 1](#)

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7 DOCUMENT INFORMATION

7.1 Publication Date

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7.2 Date Last Updated

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