



# SMAPVEX19-22 Millbrook Lidar Derived Digital Surface Model, Version 1

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## USER GUIDE

### How to Cite These Data

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

Colliander, A., Xu, X., & Yueh, S. 2023. SMAPVEX19-22 Millbrook Lidar Derived Digital Surface Model, Version 1. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <https://doi.org/10.5067/UN7H3TVNLQB8>. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT [NSIDC@NSIDC.ORG](mailto:NSIDC@NSIDC.ORG)

FOR CURRENT INFORMATION, VISIT [https://nsidc.org/data/SV19MB\\_DSM](https://nsidc.org/data/SV19MB_DSM)



National Snow and Ice Data Center

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# 1 DATA DESCRIPTION

These digital surface model (DSM) data consist of surface elevations derived from source lidar measurements collected in August 2022 in the vicinity of Millbrook, NY during the SMAPVEX19-22 campaign. The location was selected due to its forested land cover, as SMAPVEX19-22 aims to validate satellite derived soil moisture estimates in forested areas. The August collection period was selected to characterize 'leaf-on' conditions. DSM data represents the highest elevation of features on the Earth's surface, which may include bare-earth, vegetation, and human-made objects.

## 1.1 Parameters

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This data set represents surface elevations. The vertical units of the data set are meters relative to North American Vertical Datum of 1988.

## 1.2 File Information

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### 1.2.1 Format

Data files are provided in Geographic Tagged Image File Format (GeoTIFF).

### 1.2.2 File Contents

Each GeoTIFF files contains embedded georeferenced data representing surface elevation commonly referred to as a digital surface model (DSM).

### 1.2.3 Naming Convention

Files are named according to the following convention:

sv19mb\_dsm\_[tile ID]\_[yyyymm].tif

Table 1 describes the variables within each file name:

Table 1. File Naming Convention

Variable	Description
sv19mb	SMAPVEX19-22 campaign, Millbrook, NY study domain
dsm	Digital surface model
tile ID	Six-digit ID of the approximately 1000 m x 1000 m tile
yyyymm	Four-digit year and two-digit month of data acquisition
.tif	File extension

## 1.3 Spatial Information

### 1.3.1 Coverage

The Millbrook, NY site is defined by the following geographic coordinates:

Northernmost Latitude: 41.68° N

Southernmost Latitude: 42.03° N

Easternmost Longitude: 73.44° W

Westernmost Longitude: 73.79° W

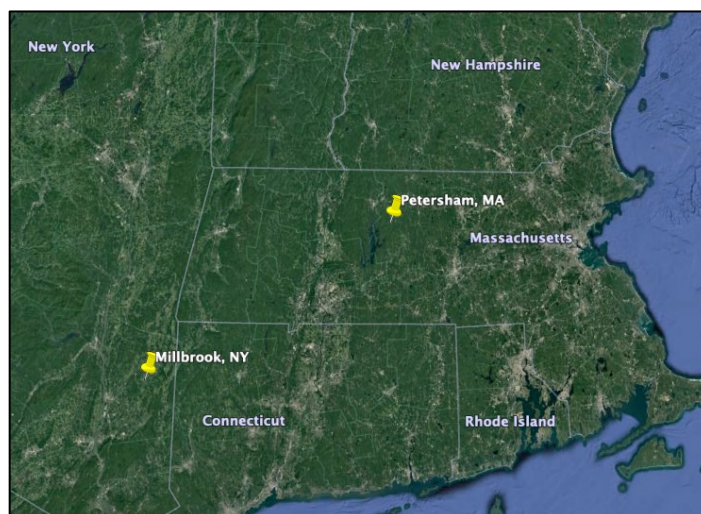


Figure 1. SMAPVEX19-22 Campaign Sites

### 1.3.2 Resolution

The spatial resolution is approximately 0.5 m. This number is approximate because data are provided in geographic coordinates.

### 1.3.3 Geolocation

These data are referenced to WGS84 horizontally and the NAVD88 (Geoid 18b) vertical datum. The following table provides additional details on geolocating this data set.

Table 2. Geolocation Details

<b>Geographic coordinate system</b>	World Geodetic System 1984
<b>Projected coordinate system</b>	WGS84
<b>Longitude of true origin</b>	Prime Meridian, Greenwich
<b>Latitude of true origin</b>	N/A
<b>Scale factor at longitude of true origin</b>	N/A

<b>Datum</b>	WGS84
<b>Ellipsoid/spheroid</b>	WGS84
<b>Units</b>	degree
<b>EPSG code</b>	4326
<b>PROJ4 string</b>	+proj=longlat +datum=WGS84 +no_defs
<b>Reference</b>	<a href="http://epsg.io/4326">http://epsg.io/4326</a>

## 1.4 Temporal Information

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### 1.4.1 Coverage and Resolution

The data set includes ~2,500 GeoTIFF files, representing elevation from 2-3, 5-6, and 8-9 August 2022.

## 2 DATA ACQUISITION AND PROCESSING

### 2.1 Acquisition

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Lidar scanning was conducted by Woolpert, under contract from NASA, using the Leica CityMapper-2 lidar mapping sensor. Approximately 50 scans were conducted. The data were acquired with a point density of 8 points per square meter.

### 2.2 Processing

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Woolpert performed the lidar point cloud data processing including calibration, cleaning, classification, and final formatting of the LAS file, then rasterizing the data to DSM. There were five classes in the LAS lidar point cloud classification scheme: low vegetation, medium vegetation, high vegetation, ground, and buildings. The data are derived using first returns only.

A first order canopy height model can be derived by subtracting digital elevation model (DEM) data (see [SMAPVEX19-22 Millbrook Lidar Derived Digital Elevation Model](#)) from the DSM.

### 2.3 Quality, Errors, and Limitations

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The vertical accuracy of the derived DSM is assumed to meet the below conditions. However, no quantitative assessment was performed.

- The RMSEz for non-vegetated ground is  $\leq 20$  cm.

- Approximately 67% of all measurements are within 20 cm and 95% within 39.2 cm on hard unobstructed surfaces.
- Approximately 95% (with 5% unrestricted outliers) of all measurements are within 58.8 cm in vegetated land cover categories combined (includes tall grass, brush, and forested areas; does not include swamps or wetlands).

## 2.4 Instrumentation

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Surveys were conducted using a Leica CityMapper-2 mapping sensor. For more information about this instrument, please see the [Leica Geosystems website](#).

## 3 RELATED DATA SETS

[SMAPVEX19-22 Massachusetts Lidar Derived Digital Surface Model](#)

[SMAPVEX19-22 Millbrook Lidar Derived Digital Elevation Model](#)

[SMAPVEX19-22 Massachusetts Lidar Derived Digital Elevation Model](#)

[SMAPVEX19-22 Millbrook Temporary Soil Moisture Network](#)

[SMAPVEX19-22 Massachusetts Temporary Soil Moisture Network](#)

[SMAPVEX19-21 Massachusetts Vegetation Optical Depth](#)

## 4 RELATED WEBSITES

[SMAP Validation Data](#)

[SMAP Overview](#)

## 5 DOCUMENT INFORMATION

### 5.1 Publication Date

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June 2023

### 5.2 Date Last Updated

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June 2023