SMAPVEX19-22 Massachusetts Lidar Derived Digital Surface Model, Version 1

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 Massachusetts 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/PCJ5Z3NN0T1G. [Date Accessed].

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 Petersham, MA 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

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

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

Data files are named according to the following convention:

sv19ma_dsm_[tile ID]_[yyyymm].tif

Table 1 describes the variables within each file name:

Table 1. File Naming Convention

Variable	Description
sv19ma	SMAPVEX19-22 campaign, Petersham, Massachusetts 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 Petersham, MA site is defined by the following geographic coordinates:

Northernmost Latitude: 42.72° N
Southernmost Latitude: 42.32° N
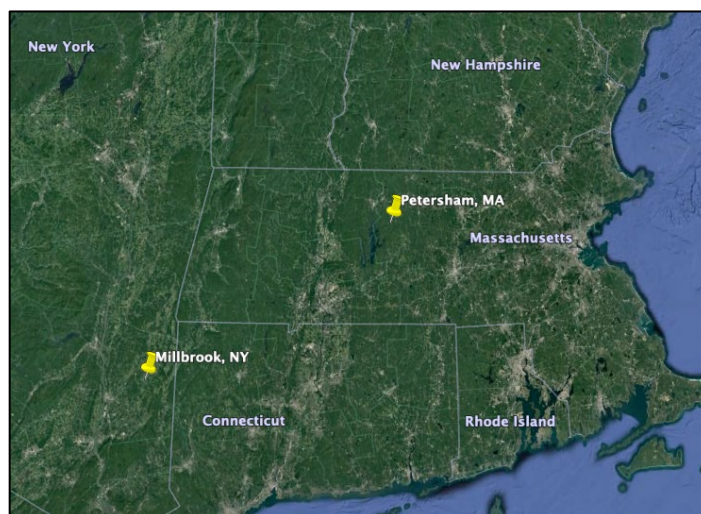Easternmost Longitude: 71.91° W
Westernmost Longitude: 72.33° W

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

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

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

1.4 Temporal Information

1.4.1 Coverage and Resolution

The data set includes ~1200 GeoTIFF files, representing elevation from 3-5 August 2022.

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition

Lidar scanning was conducted by Woolpert, under contract from NASA, using the Leica CityMapper-2 lidar mapping sensor. Approximately 40 scans were conducted. The data were acquired with a point density of 8 points per square meter.

2.2 Processing

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 Massachusetts Lidar Derived Digital Elevation Model) from the DSM.

2.3 Quality, Errors, and Limitations

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 ≤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

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 Millbrook Lidar Derived Digital Surface Model

SMAPVEX19-22 Massachusetts Lidar Derived Digital Elevation Model

SMAPVEX19-22 Millbrook Lidar Derived Digital Elevation Model

SMAPVEX19-22 Massachusetts Temporary Soil Moisture Network

SMAPVEX19-22 Millbrook 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

June 2023

5.2 Date Last Updated

June 2023