ASO L4 Lidar Snow Depth 50m UTM Grid, Version 1

USER GUIDE

How to Cite These Data

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

Painter, T. 2018. *ASO L4 Lidar Snow Depth 50m UTM Grid, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: https://doi.org/10.5067/STOT5I0U1WVI. [Date Accessed].

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

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/ASO_50M_SD

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1 DATA DESCRIPTION

This data set is a collection of 50 m resolution snow depth maps, measured by the Airborne Snow Observatory (ASO), a coupled imaging spectrometer and scanning lidar system created by NASA/JPL. The imaging spectrometer is used to quantify spectral albedo, broadband albedo, and radiative forcing by dust and black carbon in snow. The scanning lidar measures snow depth using the differential altimetry approach of subtracting snow-free gridded elevation data from snow-covered gridded elevation data (Deems et al., 2013). The 50 m gridded snow depth data in this data set were aggregated from the original 3 m snow depth measurements, which are provided in the *ASO L4 Lidar Snow Depth 3m UTM Grid* data set.

1.1 Parameters

The data product featured in this data set is snow depth in meters. An example is shown in Figure 1.

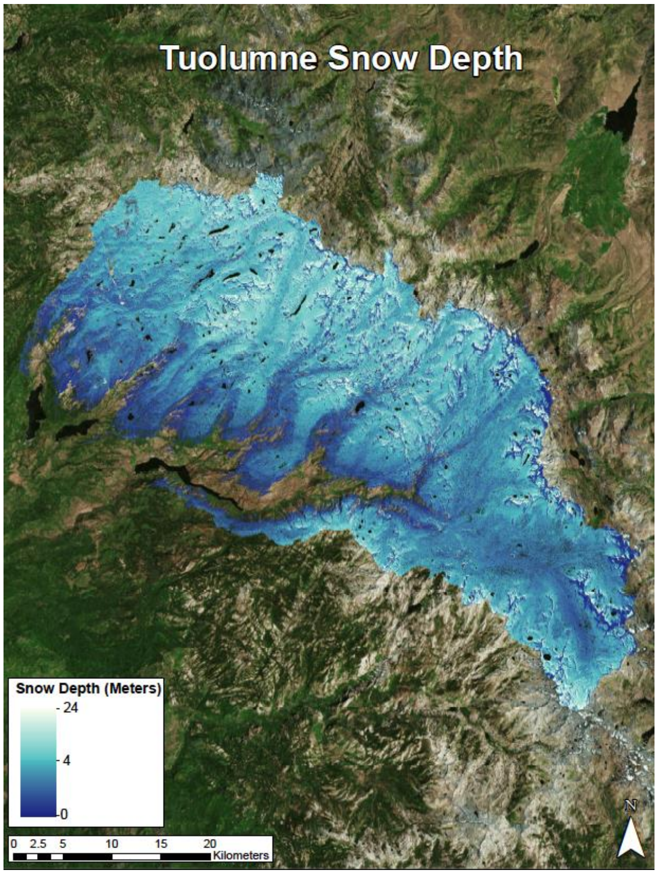

Figure 1. Snow depth (in meters) in the Tuolumne Basin, California, on 01 April 2017. Image courtesy of NASA/JPL Airborne Snow Observatory.

1.2 File Information

1.2.1 Format

Data are provided as GeoTIFF (`.tif`) formatted files. Each GeoTIFF file is paired with an associated XML file, which contains additional metadata.

1.2.2 Naming Convention

Data files are named after the following naming convention and as described in Table 1.

ASO_50M_SD_CCSCBC_YYYMMDD.tif

Example file name:

ASO_50M_SD_USCATB_20170727.tif

Table 1. File Naming Convention

File Designator	Description
ASO_50M_SD	Data set ID
CC	Two digit country code, e.g. US = United States
SC	Two digit US state code, e.g. CA = California
BC	Two digit basin (site) code, e.g. TB = Tuolumne Basin. See the ASO basins spreadsheet for a list of basins and basin codes.
YYYYMMDD	Data acquisition date
.tif	GeoTIFF formatted file

1.3 Spatial Information

1.3.1 Coverage

Spatial coverage for this data set includes several basins listed in the ASO basins spreadsheet. Figure 2 depicts four California basins as an example.

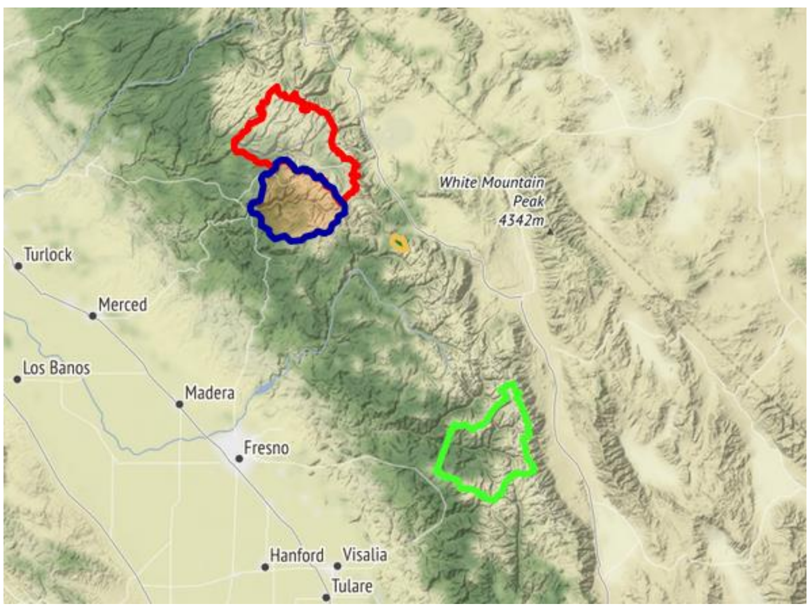

Figure 2. ASO California basins: Tuolumne Basin (red), Merced Basin (blue), Lake Basin (orange), and Kings Basin (green). Image courtesy of NASA/JPL Airborne Snow Observatory.

1.3.2 Resolution

50 m x 50 m grid

1.3.3 Geolocation

- Datum: WGS84 Ellipsoidal
- UTM zones: 10N, 11N, 12N, 13N
- EPSG codes: 32610, 32611, 32612, 32613

1.4 Temporal Information

1.4.1 Coverage

03 April 2013 to 16 July 2019

ASO Snow-Off campaigns typically occur between August and October, while the Snow-On campaigns are typically conducted between February and June.

1.4.2 Resolution

Varies by seasonal campaigns. In general, given the rapidly changing nature of snow cover presence, depth, and surface properties that modulate its melt, ASO flies target basins on a weekly basis from mid-winter through complete snowmelt.

2 DATA ACQUISITION AND PROCESSING

2.1 Processing

The reader is referred to Painter et al. (2016) for details on the processing steps used to generate these data.

2.2 Quality, Errors, and Limitations

The reader is referred to Painter et al. (2016) for more information on the quality of the data.

2.3 Instrumentation

2.3.1 Lidar System

The Riegl LMS-Q1560 airborne laser scanner (ALS) measures surface elevations from which snow depths are calculated. The Q1560 uses dual lasers at 1064 nm wavelength, each with a 60° scan angle (±30° across-nadir) and a 14° angle relative to the cross-track axis, producing an up to 8° fore/aft look angle (off-nadir in the along-track direction). A 1064 nm wavelength system is used because of its relatively small laser penetration depth in snow and relatively high snow reflectance at that wavelength, as well as greater penetration through vegetation canopies.

Note: Current processing uses some data from the CASI 1500 imaging spectrometer data to discriminate processing steps, but the bulk of the snow depth information comes from the Riegl Q1560 airborne laser scanner.

The required level of geolocation accuracy is achieved through the use of a single lidar-integrated Trimble Applanix POS/AV 510 GPS and Inertial Measurement Unit (IMU). The IMU has angular uncertainties of 0.005° in roll, 0.005° in pitch, and 0.008° in true heading after post-processing, and a resultant attitude uncertainty of 0.011°.

For more detailed information see Deems et al. (2013) and Painter et al. (2016).

3 SOFTWARE AND TOOLS

Software that recognizes the GeoTIFF file format is recommended for these images, such as the GIS software QGIS and ArcGIS. See also the libGeoTIFF and GDAL websites for more information.

4 RELATED DATA SETS

ASO L4 Lidar Snow Depth 3m UTM Grid
ASO L4 Lidar Snow Water Equivalent 50m UTM Grid
NASA SnowEx data sets at NSIDC

5 RELATED WEBSITES

Airborne Snow Observatory Project at NASA/JPL
SnowEx Project at NASA
iSWGR - NASA International Snow Working Group Remote Sensing

6 CONTACTS AND ACKNOWLEDGMENTS

6.1 Contacts

Thomas Painter

Jet Propulsion Laboratory

4800 Oak Grove Drive

Pasadena, CA 91109

6.2 Acknowledgments

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7 REFERENCES

Deems, J. S., Painter, T. H., & Finnegan, D. C. (2013). Lidar measurement of snow depth: a review. Journal of Glaciology, 59(215), 467–479. https://doi.org/10.3189/2013jog12j154

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8 DOCUMENT INFORMATION

8.1 Publication Date

23 May 2018

8.2 Date Last Updated

10 March 2010