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Soil Moisture Visualizer

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Documentation Revision Date: 2017-04-13

Data Set Version: V1

Summary

The goal of the Soil Moisture Visualizer (SMV) is to bring together multiple sources of soil moisture data available for North America into a single platform for visualization and download. The visualizer harmonizes surface and root zone soil moisture data sets that are in diverse native data formats and encompass a range of spatial footprints, soil depths, and measurement frequencies. The SMV consists of a web-based application for visualization and spatial subsetting of the soil moisture data and accompanying REST-based services (being developed) for accessing the data.

Soil Moisture Visualizer

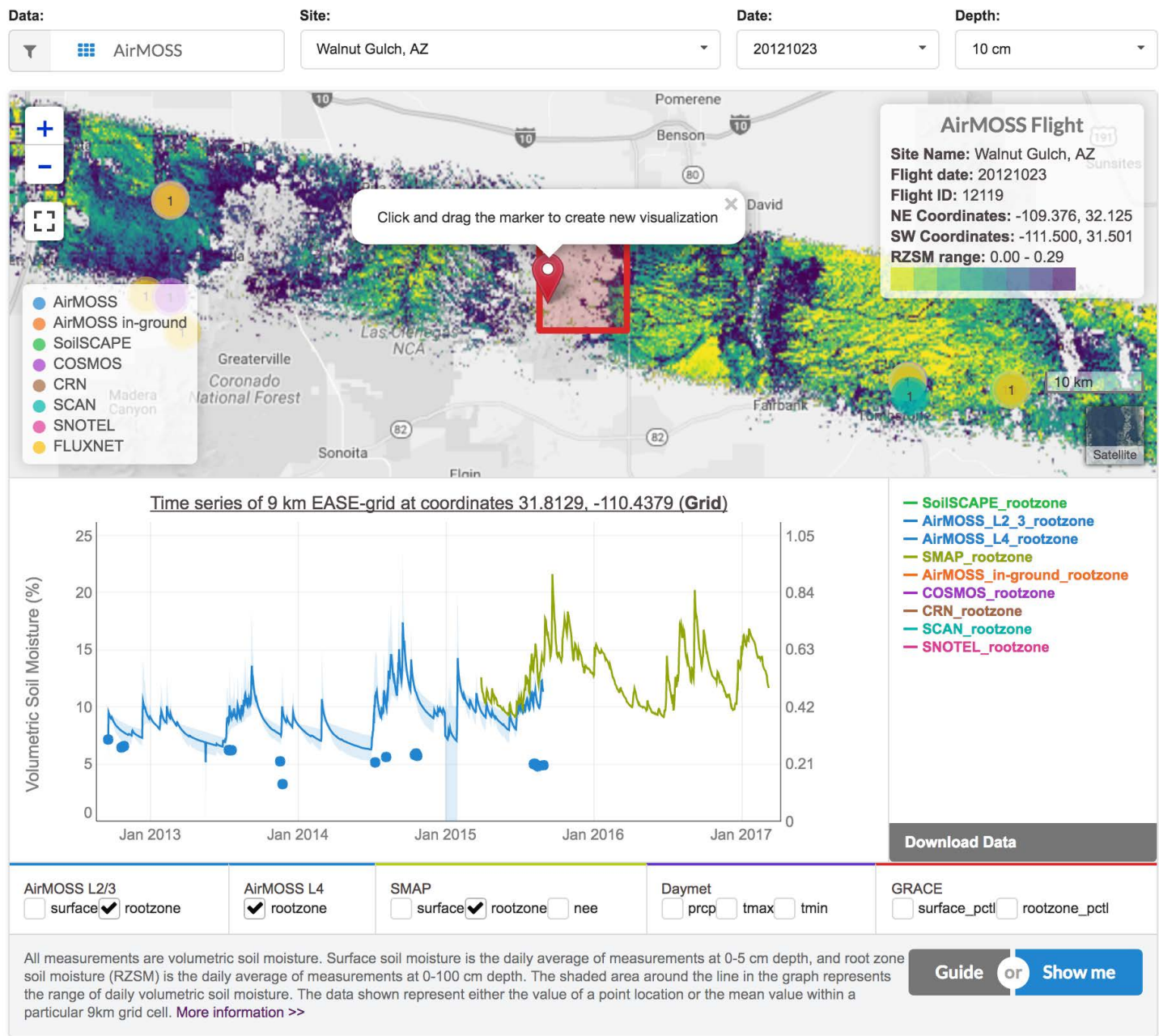


Figure 1. The Soil Moisture Visualizer offers numerous soil moisture data sets via a single graphical interface.

Citation

ORNL DAAC. 2017. Soil Moisture Visualizer. ORNL DAAC, Oak Ridge, Tennessee, USA. <https://doi.org/10.3334/ORNLDAAC/1366>

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1. Data Set Overview

Project: [Airborne Microwave Observatory of Subcanopy and Subsurface \(AirMOSS\)](#)

The goal of NASA's Airborne Microwave Observatory of Subcanopy and Subsurface (AirMOSS) investigation is to provide high-resolution observations of root-zone soil moisture over regions representative of the major North American climatic habitats (biomes), quantify the impact of variations in soil moisture on the estimation of regional carbon fluxes, and extrapolate the reduced-uncertainty estimates of regional carbon fluxes to the continental scale of North America.

- The AirMOSS campaign used an airborne ultra-high frequency synthetic aperture radar flown on a Gulfstream-III aircraft to derive estimates of soil moisture down to approximately 1.2 meters.
- Extensive ground, tower, and aircraft in-situ measurements were collected to validate root-zone soil measurements and carbon flux model estimates.

The AirMOSS soil measurements can be used to better understand carbon fluxes and their associated uncertainties on a continental scale. Additionally, AirMOSS data provide a direct means for validating root-zone soil measurement algorithms from the Soil Moisture Active & Passive (SMAP) mission and assessing the impact of fine-scale heterogeneities in its coarse-resolution products.

The following data are available through the Soil Moisture Visualizer:

Moghaddam, M., A. Tabatabaenejad, R.H. Chen, S.S. Saatchi, S. Jaruwatanadilok, M. Burgin, X. Duan, and M.L. Truong-Loi. 2016. AirMOSS: L2/3 Volumetric Soil Moisture Profiles Derived From Radar, 2012-2015. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/1418>

Moghaddam, M., A.R. Silva, D. Clewley, R. Akbar, S.A. Hussaini, J. Whitcomb, R. Devarakonda, R. Shrestha, R.B. Cook, G. Prakash, S.K. Santhana Vannan, and A.G. Boyer. 2016. Soil Moisture Profiles and Temperature Data from SoilSCAPE Sites, USA. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/1339>

ORNL DAAC. 2008. MODIS Collection 5 Land Products Global Subsetting and Visualization Tool. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/1241>

Zreda, M., Shuttleworth, W. J., Zeng, X., Zweck, C., Desilets, D., Franz, T., and Rosolem, R. 2012. COSMOS: the COsmic-ray Soil Moisture Observing System, Hydrol. Earth Syst. Sci., 16, 4079-4099, <http://dx.doi.org/10.5194/hess-16-4079-2012>, 2012.

Reichle, R., G. De Lannoy, R. D. Koster, W. T. Crow, and J. S. Kimball. 2016. SMAP L4 9 km EASE-Grid Surface and Root Zone Soil Moisture Land Model Constants, Version 2. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. <http://dx.doi.org/10.5067/VBRUC1AFRQ22>

U.S. Climate Reference Network / U.S. Regional Climate Reference Network (USCRN/USRCRN) Data. Version 2.1. <http://www1.ncdc.noaa.gov/pub/data/uscrn/products/daily01>

FLUXNET2015 Dataset. <http://fluxnet.fluxdata.org/data/fluxnet2015-dataset/>. Funding for AmeriFlux data resources was provided by the U.S. Department of Energy's Office of Science.

Snow Climate Analysis Network (SCAN). NRCS National Water and Climate Center. <https://www.wcc.nrcs.usda.gov/scan/>

Snow Telemetry (SNOTEL). NRCS National Water and Climate Center. <https://www.wcc.nrcs.usda.gov/snow/>

Matthew Rodell and Hiroko Kato Beaudoin, NASA/GSFC/HSL (2017), Groundwater and Soil Moisture Conditions from GRACE Data Assimilation L4 7-days 0.125 x 0.125 degree V2.0, Greenbelt, MD, USA, Goddard Earth Sciences Data and Information Services Center (GES DISC), <http://dx.doi.org/10.5067/ASNKR4DD9AMW>

Thornton, P.E., M.M. Thornton, B.W. Mayer, Y. Wei, R. Devarakonda, R.S. Vose, and R.B. Cook. 2016. Daymet: Daily Surface Weather Data on a 1-km Grid for North America, Version 3. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/1328>

A full list of AirMOSS data products is available at: <https://airmoss.ornl.gov/dataproducts.html>.

2. Data Characteristics

Spatial Coverage: North America

Temporal Coverage: 20110803 to present. Each data product has different temporal coverage within this overall time period.

The visualization uses the [L2/3 RZSM](#) and in situ [L2 IGSM](#) data for AirMOSS, the L4 [SPL4](#) (9 km) product for SMAP, the COSMOS level 3 soil moisture ([SM12H](#)), MODIS products [MOD16A2](#) (1 km) for evapotranspiration (ET), [MOD13Q1](#) (0.25 km) for enhanced vegetation index (EVI), and [MOD11A2](#) (1 km) for land surface temperature (LST), and [the Daymet gridded data version 3.0](#). The visualization is expected to be updated on a weekly basis, but some data sets might have longer latency period set by the provider.

- **Temporal resolution:** Currently, the visualizer displays all the available soil moisture data as daily averages. This is done to bring uniformity among the datasets available at different time intervals. If a finer temporal resolution is required, the users can directly download the data from the data source section and create their own visualization.
- **Spatial aggregation and extent:** For point data visualization (e.g. SoilSCAPE nodes), the corresponding grid data (e.g. SMAP) is the value from

the grid underlying the point. Similarly, for grid-data visualization, the corresponding point data is the average of all the points located within the grid. Currently the visualizer only displays the data from the North American region (within the bounds of 8°N, 179°W and 83°N, 52°W).

- **Soil moisture:** When multiple measurements or estimation of soil moisture exists for different depths, the surface soil moisture is computed as the average of all the measurements from 0-5cm depth and the root zone soil moisture (RZSM) from 0-100cm depth.

For a complete list of data products included in the visualizer, data download formats, and a usage tutorial, see <https://airmoss.ornl.gov/visualize/guide.html>.

3. Application and Derivation

This soil moisture data can be used to calibrate and validate other soil moisture measurements and to better understand carbon fluxes and their associated uncertainties on a continental scale.

4. Quality Assessment

Refer to the documentation for each individual data product for quality assessment information.

5. Data Acquisition, Materials, and Methods

For the most up-to-date information, please refer to <https://airmoss.ornl.gov/visualize/guide.html>.

6. Data Access

These data are available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

[Soil Moisture Visualizer](#)

Contact for Data Center Access Information:

- E-mail: uso@daac.ornl.gov
- Telephone: +1 (865) 241-3952

7. References

Moghaddam, M., A. Tabatabaeenejad, R.H. Chen, S.S. Saatchi, S. Jaruwatanadilok, M. Burgin, X. Duan, and M.L. Truong-Loi. 2016. AirMOSS: L2/3 Volumetric Soil Moisture Profiles Derived From Radar, 2012-2015. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/1418>

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Zreda, M., Shuttleworth, W. J., Zeng, X., Zweck, C., Desilets, D., Franz, T., and Rosolem, R. 2012. COSMOS: the COsmic-ray Soil Moisture Observing System, Hydrol. Earth Syst. Sci., 16, 4079-4099, <http://dx.doi.org/10.5194/hess-16-4079-2012>, 2012.

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U.S. Climate Reference Network / U.S. Regional Climate Reference Network (USCRN/USRCRN) Data. Version 2.1. <http://www1.ncdc.noaa.gov/pub/data/uscrn/products/daily01>

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Snow Climate Analysis Network (SCAN). NRCS National Water and Climate Center. <https://www.wcc.nrcs.usda.gov/scan/>

Snow Telemetry (SNOTEL). NRCS National Water and Climate Center. <https://www.wcc.nrcs.usda.gov/snow/>

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Thornton, P.E., M.M. Thornton, B.W. Mayer, Y. Wei, R. Devarakonda, R.S. Vose, and R.B. Cook. 2016. Daymet: Daily Surface Weather Data on a 1-km Grid for North America, Version 3. ORNL DAAC, Oak Ridge, Tennessee, USA. <http://dx.doi.org/10.3334/ORNLDAAC/1328>

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