

Ⓟ A 1km experimental dataset for the Mediterranean terrestrial region of Soil Moisture, Land Surface Temperature and Vegetation Optical Depth from passive microwave data.

Introduction

This dataset is the Planet Labs PBC (VanderSat B.V.) contribution to the ESA 4DMED hydrology project (<https://www.4dmed-hydrology.org/>). It includes Soil Moisture, Land Surface Temperature and Vegetation Optical Depth for the 4DMED spatial domain and time period (2015-2021) at 1km pixel size. If you use the data please include the following reference:

Jaap Schellekens, Tessa Kramer, Michel van Klink, Robin van der Schalie, Yoann Malbeteau, Arjan Geers, Richard de Jeu. (2022) *A 1km experimental dataset for the Mediterranean terrestrial region of Soil Moisture, Land Surface Temperature and Vegetation Optical Depth from passive microwave data*. DOI: 10.5281/zenodo.7684993. Planet Labs PBC/VanderSat B.V., ESA Contract No. 4000136272/21/I-EF

SM-SMAP-L-DESC V4.0 1000

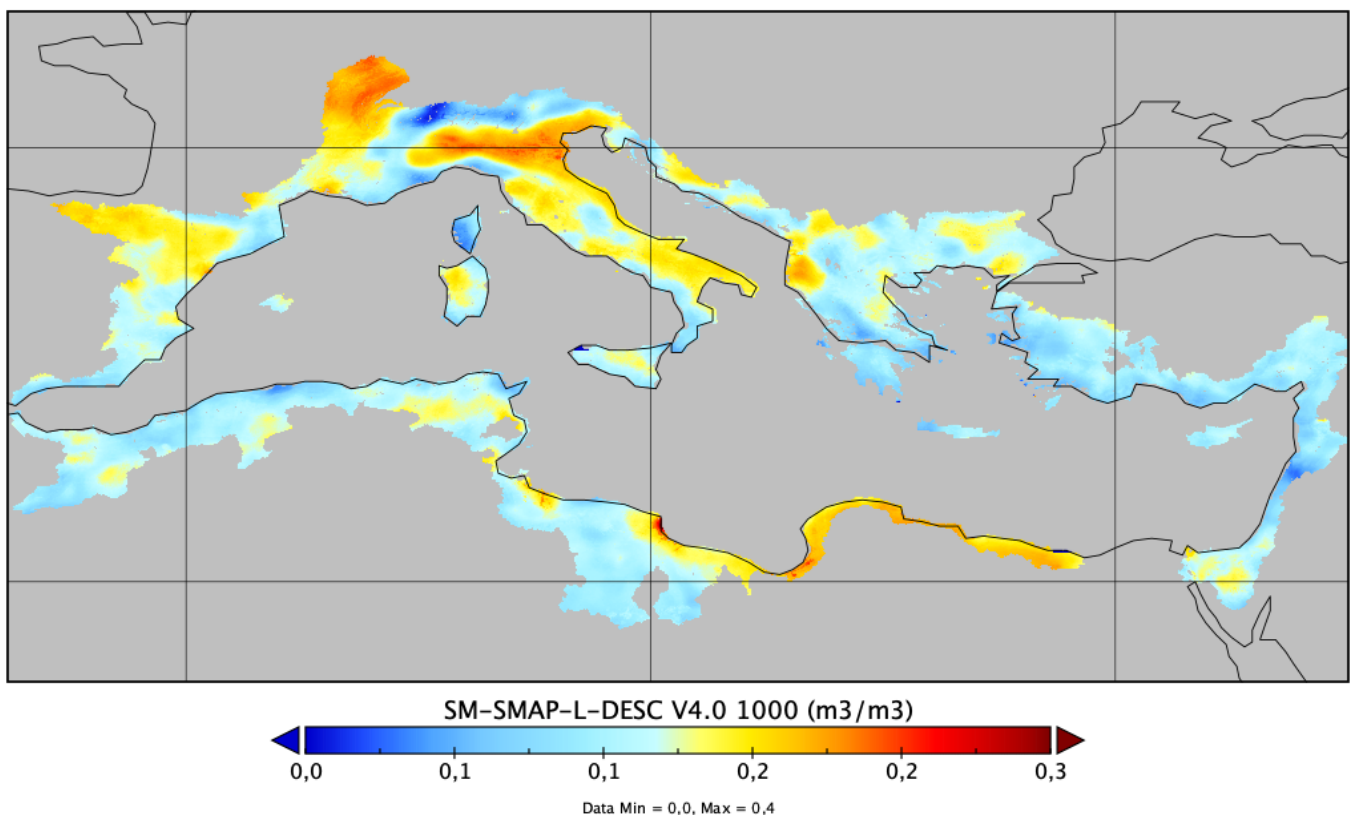


Figure 1: Average L-Band Soil moisture for 2020 over the 4dmed spatial domain

Variables and files

The dataset consists of the following files and products for the 4DMED domain. Detailed information about the products can also be found at docs.vandersat.com:

- **planet-teff-4dmed-V4.0.zip** - LST (TEFF) ascending (daytime) and descending (nighttime)
 - **TEFF-AMSR2-ASC_V4.0_1000**
 - Land surface temperature daytime (13:30 solar time) at 1 km
 - **TEFF-AMSR2-DESC_V4.0_1000**
 - Land surface temperature nighttime (01:30 solar time) at 1 km
- **planet-teff-qf-4dmed-V4.0.zip** - LST (TEFF) quality flags
 - **QF-TEFF-AMSR2-ASC_V4.0_1000**
 - Land surface temperature daytime quality flag. [docs.vandersat.com flags](https://docs.vandersat.com) and [docs.vandersat.com python example](https://docs.vandersat.com)
 - **QF-TEFF-AMSR2-DESC_V4.0_1000**
 - Land surface temperature daytime quality flag. [docs.vandersat.com flags](https://docs.vandersat.com) and [docs.vandersat.com python example](https://docs.vandersat.com)
- **planet-vod-4dmed-V4.1.zip** - vegetation optical depth C and X band (interpolated from C3S passive soil moisture)
 - **VOD_AMSR2_C1_DESC_V41_1000**
 - C1 band Vegetation Optical Depth (nighttime, 01:30 solar time) at 1km (interpolated from 25 km)
 - **VOD_AMSR2_X_DESC_V41_1000**
 - X band Vegetation Optical Depth (nighttime, 01:30 solar time) at 1km (interpolated from 25 km)
- **planet-sm-4dmed-V4.0.zip** - All soil moisture products (C1, X and L-band)
 - **SM-AMSR2-C1-DESC_V4.0_1000**
 - C1 band soil moisture (nighttime, 01:30 solar time) at 1km
 - **SM-AMSR2-X-DESC_V4.0_1000**
 - X band soil moisture (nighttime, 01:30 solar time) at 1km
 - **SM-SMAP-L-DESC_V4.0_1000**
 - L band soil moisture (06:00 solar time) at 1km
- **planet-sm-qf-4dmed-V4.0.zip** - Soil moisture quality maps see https://docs.vandersat.com/data_products/soil_water_content/data_flags.html and https://docs.vandersat.com/data_products/soil_water_content/data_flags.html#decoding-a-flag-file-using-python
 - **QF-SM-AMSR2-C1-DESC_V4.0_1000**
 - C1 band soil moisture (nighttime, 01:30 solar time) at 1km
 - **QF-SM-AMSR2-X-DESC_V4.0_1000**
 - X band soil moisture (nighttime, 01:30 solar time) at 1km
 - **QF-SM-SMAP-L-DESC_V4.0_1000**
 - L band soil moisture quality flags (06:00 solar time) at 1km
- **planet-sm-cor-4dmed-V4.0.zip** - Yearly correlation maps of soil moisture derived from the difference microwave bands. To be used as an extra quality indicator (for example undetected RFI) or for uncertainty estimation
 - **SM-CORR-C1-X-DESC_V4.0_1000** - yearly C1 vs X band pearson's correlation maps
 - **SM-CORR-L-C1-DESC_V4.0_1000** - yearly L vs C1 band pearson's correlation maps
 - **SM-CORR-L-X-DESC_V4.0_1000** - yearly L vs X band pearson's correlation maps

- **planet-aux-flags-4dmed-V4.0** - Extra flags for frozen soil and bare soil. Determined at 0.25 degree and interpolated to the 4dmed grid
 - **QF-SNOWFROZEN-AMSR2-ASC_1000::RD** - Frozen soil determined from daytime data
 - **QF-SNOWFROZEN-AMSR2-DESC_1000::RD** - Frozen soil determined from nighttime data
 - **QF-BARESOIL-AMSR2-DESC_1000::RD** - Bare soil determined from nighttime data
 - **QF-BARESOIL-AMSR2-ASC_1000::RD** - Bare soil determined from daytime data

All files are archived into one zip file per product group. Each individual netcdf file in the zip file consists of one observation for the whole domain. If you need you can combine the files into one file using the cdo software <https://code.mpimet.mpg.de/projects/cdo> (e.g. `cdo -f nc4c mergetime *.nc outfile.nc`).

License

The data for 4DMED is released under the Creative Commons license: CC BY-NC-SA 4.0 (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

- Contains modified Copernicus Sentinel data 2015-2021
- Contains modified JAXA GCOM-W1/AMSR2 data 2015-2021
- Contains modified SMAP L1B Radiometer data: Piepmeier, J. R., P. Mohammed, J. Peng, E. J. Kim, G. De Amici, J. Chaubell, and C. Ruf. 2020. SMAP L1B Radiometer Half-Orbit Time-Ordered Brightness Temperatures, Version 4,5. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. doi: <https://doi.org/10.5067/ZHHBN1KQLI20>

Contact

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Versions

- 1.0 Initial creation
- 1.1 Adjusted 4DMED Mask. Data itself unchanged but more LST (TEFF) measurements added
- 1.2 Removed VOD and replaced by 25km C3S VOD interpolated to 1km (V4.1)

Further information

More information on the data and the flags can be found at <https://docs.vandersat.com> and <https://www.4dmed-hydrology.org>

Background publications

R.A.M. De Jeu, A.H.A. De Nijs, M.H.W. Van Klink (2016) *Method and system for improving the resolution of sensor data*, US10643098B2,EP3469516B1, WO2017216186A1

De Jeu, R. A., Holmes, T. R., Parinussa, R. M., & Owe, M. (2014). *A spatially coherent global soil moisture product with improved temporal resolution*. Journal of hydrology, 516, 284-296.

Moesinger, L., Dorigo, W., de Jeu, R., van der Schalie, R., Scanlon, T., Teubner, I. and Forkel, M., 2020. *The global long-term microwave vegetation optical depth climate archive (VODCA)*. Earth System Science Data, 12(1), pp.177-196.

Schmidt, L., Forkel, M., Zotta, R.-M., Scherrer, S., Dorigo, W. A., Kuhn-Régnier, A., van der Schalie, R., and Yebra, M.: *Assessing the sensitivity of multi-frequency passive microwave vegetation optical depth to vegetation properties*, *Biogeosciences Discuss.* [preprint], <https://doi.org/10.5194/bg-2022-85>, in review, 2022

Van der Schalie, R., de Jeu, R.A.M., Kerr, Y.H., Wigneron, J.P., Rodríguez-Fernández, N.J., Al- Yaari, A., Parinussa, R.M., Mecklenburg, S. and Drusch, M. (2017), *The merging of radiative transfer based surface soil moisture data from SMOS and AMSR-E*, *Remote Sensing of Environment*, 189, pp.180-193.

van der Vliet, M., van der Schalie, R., Rodriguez-Fernandez, N., Colliander, A., de Jeu, R., Preimesberger, W., Scanlon, T., Dorigo, W., 2020. Reconciling Flagging Strategies for Multi-Sensor Satellite Soil Moisture Climate Data Records. *Remote Sensing* 12, 3439. <https://doi.org/10.3390/rs12203439>