

## **NASA-USDA Enhanced SMAP Global Soil Moisture Data**

The NASA-USDA Enhanced SMAP Global soil moisture data provides soil moisture information across the globe at 10-km spatial resolution. This data set includes: surface and subsurface soil moisture (mm), soil moisture profile (%), surface and subsurface soil moisture anomalies (-). The data set is generated by integrating satellite-derived Soil Moisture Active Passive (SMAP) soil moisture observations into the modified two-layer Palmer model using a 1-D Ensemble Kalman Filter (EnKF) data assimilation approach. The Palmer model is driven by precipitation and temperature observations provided by the United States (U.S.) Air Force 557th Weather Wing (formerly known as the U.S. Air Force Weather Agency, AFWA). The current SMAP data archive spans from March 31, 2015 and provides multiple soil moisture products developed using different algorithms. Here, we used the Level 3 (L3) SMAP product generated using the single channel algorithm (SCA) and distributed at a 9-km spatial resolution. Soil moisture anomalies were computed from the climatology of the day of interest. The climatology were estimated based on the full data record of the SMAP satellite observation and the 31 day centered moving window approach. The assimilation of the SMAP soil moisture observations help improve the model-based soil moisture predictions particularly over poorly instrumented areas of the world that lack good quality precipitation data. This dataset was developed by the Hydrological Science Laboratory at NASA's Goddard Space Flight Center in cooperation with USDA Foreign Agricultural Services and USDA Hydrology and Remote Sensing Lab.

### **Data availability:**

01 April 2015 – present

3-days composites

### **Spatial coverage:**

180°W – 180°E, 90°N-60°S

### **Data access and file formats:**

NASA-USDA Enhanced SMAP Global Soil Moisture Data are available in both Gridded Binary (grb2), and Georeferenced Tagged Image File Format (GeoTiff). The binary format of the data can be accessed using the NASA Global Inventory Modeling and Mapping Studies (GIMMS) system. The tiff format of the data can be obtained using the Google Earth Engine.

### **Data access using GIMMS system:**

- **Data links:**

- Surface and Sub-surface soil moisture (\*.as1.grib2, \*.as2.grib2)  
<https://gimms.gsfc.nasa.gov/SMOS/SMAP/L03/>
- Surface and Sub-surface soil moisture anomaly (\*anom1.grib2, \*anom2.grib2)  
<https://gimms.gsfc.nasa.gov/SMOS/SMAP/L05/>
- Soil moisture profile (\*smp.grib2) : <https://gimms.gsfc.nasa.gov/SMOS/SMAP/L04/>

- **File naming convention:**

NASA-USDA Enhanced SMAP Global Soil Moisture data sets are named in accordance with the following convention:

<start date>\_<end date>.\*.grb2

| Attribute  | Description                                    |
|------------|--|
| start date | <YYYYMMDD>, start date of the composite period |
| end date   | <YYYYMMDD>, end date of the composite period   |

For examples, file name for 3-day surface soil moisture composites for the start date of April 2, 2015 and end date of April 4, 2015 is “20150402\_20150404.as1.grb2”

**Data access using Google Earth Engine:**

- GEE data link: [https://developers.google.com/earth-engine/datasets/catalog/NASA\\_USDA\\_HSL\\_SMAP10KM\\_soil\\_moisture](https://developers.google.com/earth-engine/datasets/catalog/NASA_USDA_HSL_SMAP10KM_soil_moisture)
- **Band name and properties :**

| Band                              | Band Name | Description                      | units |
|-----------------------------------|-----------|----------------------------------|-------|
| 0                                 | ssm       | Surface soil moisture            | mm    |
| 1                                 | susm      | Subsurface soil moisture         | mm    |
| 2                                 | smp       | Soil moisture profile            | (%)   |
| 3                                 | ssma      | Surface soil moisture anomaly    | -     |
| 4                                 | susma     | Subsurface soil moisture anomaly | -     |
| Property                          |           | Value                            |       |
| Columns and Rows                  |           | 2560,1920                        |       |
| Number of Bands                   |           | 5                                |       |
| Cell Size                         |           | 0.140625, 0.09375                |       |
| Spatial Reference                 |           | GCS_WGS_1984                     |       |
| Extent (Top, Left, Right, Bottom) |           | 90,-180,180,-90                  |       |

- **File naming convention:**

NASA-USDA Enhanced SMAP Global Soil Moisture data sets are named in accordance with the following convention:

NASA\_USDA\_SMAP\_SM<start date>\_<end date>.tiff

| Attribute  | Description                                    |
|------------|--|
| start date | <YYYYMMDD>, start date of the composite period |
| end date   | <YYYYMMDD>, end date of the composite period   |

For examples, file name for 3-day composites for the start date of April 2, 2015 and end date of April 4, 2015 is “NASA\_USDA\_SMAP\_SM20150402\_20150404.tiff”

**Provider:**

NASA Goddard Space Flight Center, Greenbelt, MD.

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## References:

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