

## README FILE

**Products: Soil Moisture Maps**

**Data used: Sentinel-1 (SAR- radar sensor) and Sentinel-2 (optical sensor)**

**Scale: Plot scale**

**Site: Occitanie Region, France**

The soil moisture maps were carried out at a plot scale. A map is provided each 6 days (12 days with Sentinel-1A and 12 days with Sentinel-1B) for the period between September 2016 and March 2019.

Inversion algorithm for estimating soil moisture was applied for agricultural areas with any vegetation cover.

The land cover maps provided by Jordi Inglada et al. (Cesbio, Theia) were used as well as Sentinel-2 images corrected for atmospheric effects. The Land cover maps were used to extract the agricultural areas. Sentinel-2 images were used to calculate the NDVI (Normalized Differential Vegetation Index) and to segment the agricultural areas in order to extract homogeneous polygons within agricultural plots.

Using several in situ measurements of soil moisture, the accuracy on soil moisture estimation was evaluated to be about 6 vol.

The table below details each Sentinel-1 acquisition date and the corresponding NDVI map used in producing the soil moisture map:

| Sentinel-1 acquisition date | NDVI map used  |
|-----------------------------|----------------|
| September – October 2016    | September 2016 |
| November – December 2016    | December 2016  |
| January – February 2017     | February 2017  |
| March 2017                  | March 2017     |
| April – May 2017            | April 2017     |
| June – July 2017            | June 2017      |
| August 2017                 | August 2017    |
| September – October 2017    | September 2017 |
| November – December 2017    | November 2017  |
| January 2018                | December 2017  |
| February – March 2018       | February 2018  |
| April – May 2018            | April 2018     |
| June 2018                   | June 2018      |
| July 2018                   | July 2018      |
| August 2018                 | August 2018    |
| September 2018              | September 2018 |
| October –November 2018      | October 2018   |
| December 2018-January 2019  | January 2019   |
| February 2019               | February 2019  |
| March 2019                  | March 2019     |

## Deliverable description

The Soil Moisture Maps are divided into two main folders:

- **S1A: referring to maps derived from Sentinel 1A satellite**

The folder contains four footprint folders:

- Footprint\_1
- Footprint\_2
- Footprint\_3
- Footprint\_4

Each footprint folder contains the soil moisture maps corresponding to the footprint location.

To see the location of each footprint according to Occitanie please refer to the provided map "Footprint\_S1A (.JPEG)" in folder S1A.

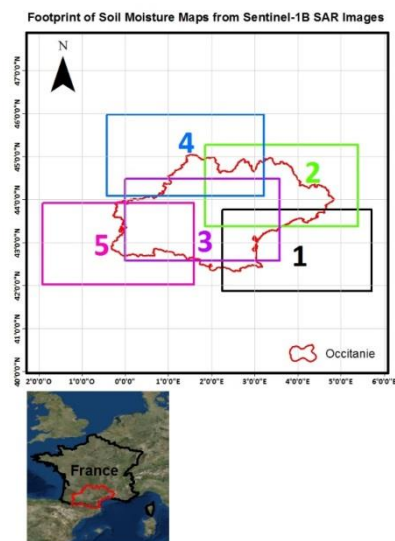
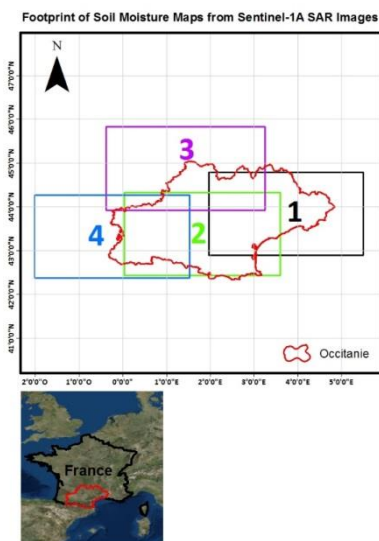
- **S1B: referring to maps derived from Sentinel 1B Satellite**

The folder contains four footprint folders:

- Footprint\_1
- Footprint\_2
- Footprint\_3
- Footprint\_4
- Footprint\_5

Each footprint folder contains the soil moisture maps corresponding to the footprint location.

To see the location of each footprint according to Occitanie please refer to the provided map "Footprint\_S1B (.JPEG)" in folder S1B.



## Format:

Format description of soil moisture maps (for example 20160904T173856\_mv.tif):

- GeoTIFF
- Structure of files name: `yyyymmddThhmmss_mv.tif`
  - yyyy: year
  - mm: month
  - dd: acquisition day

T is used to separate the date and the time (UTC)

- hh: hour
- mm: minutes
- ss: seconds

## Important:

1. In the provided soil moisture maps (WGS84, EPSG: 4326), the soil moisture values (mv) are multiplied by **5**. In order to derive the estimated soil moisture value from the provided maps **it is necessary to divide** by **5**.

$$\text{Soil Moisture Estimation (mv Vol. \%)} = \frac{\text{Value obtained from the Map}}{5}$$

2. In the provided NDVI maps (NDVI folder, Geotiff format), the NDVI values are multiplied by **100**. To derive the NDVI value from the maps **it is necessary to divide** the obtained value by **100**.

$$\text{NDVI} = \frac{\text{Value obtained from the Map}}{100}$$

3. Null values in the soil moisture maps = no data (no soil moisture estimation)

Nicolas Baghdadi, Mohammad El Hajj, Hassan Bazzi

Avec la collaboration de Mehrez Zribi (Cesbio)

Irstea, TETIS, Montpellier

