

README FILE

Products: Soil Moisture Maps

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

Scale: Plot scale

Site: Bekaa region, Lebanon

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 2017 and August 2019.

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

The Land cover map generated by the National Centre for Remote Sensing CNRS-Lebanon for the year 2017 was 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.

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 2017	NDVI September 2017
October 2017	NDVI October 2017
November 2017	NDVI November 2017
December 2017 - January 2018	NDVI December 2017
February - March 2018	NDVI March 2018
April 2018	NDVI April 2018
May 2018	NDVI May 2018
June 2018	NDVI June 2018
July 2018	NDVI July 2018
August 2018	NDVI August 2018
September 2018	NDVI September 2018
October 2018	NDVI October 2018
November 2018	NDVI November 2018
December 2018	NDVI December 2018
January 2019	NDVI January 2019
February 2019	NDVI February 2019
March 2019	NDVI March 2019
April 2019	NDVI April 2019
May 2019	NDVI May 2019
June 2019	NDVI June 2019
July 2019	NDVI July 2019
August 2019	NDVI August 2019

Deliverable description

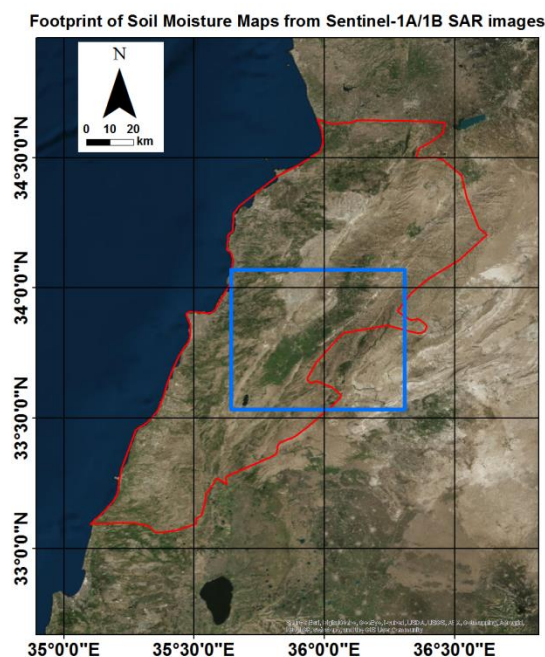
The Soil Moisture Maps are divided into two main folders:

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

To see the location of S1A surface soil moisture map according to Bekaa region please refer to the provided map "Footprint_S1A (.JPEG)" in folder S1A.

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

To see the location of S1B surface soil moisture map according to Bekaa region 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)
4. **Attention** : When the soil temperature is negative (Frozen Conditions), the real water content of the soil is higher than that which could be estimated from SAR images because a part of the water content is found on ice form.

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