Drought monitoring in Romania based on CGLS products

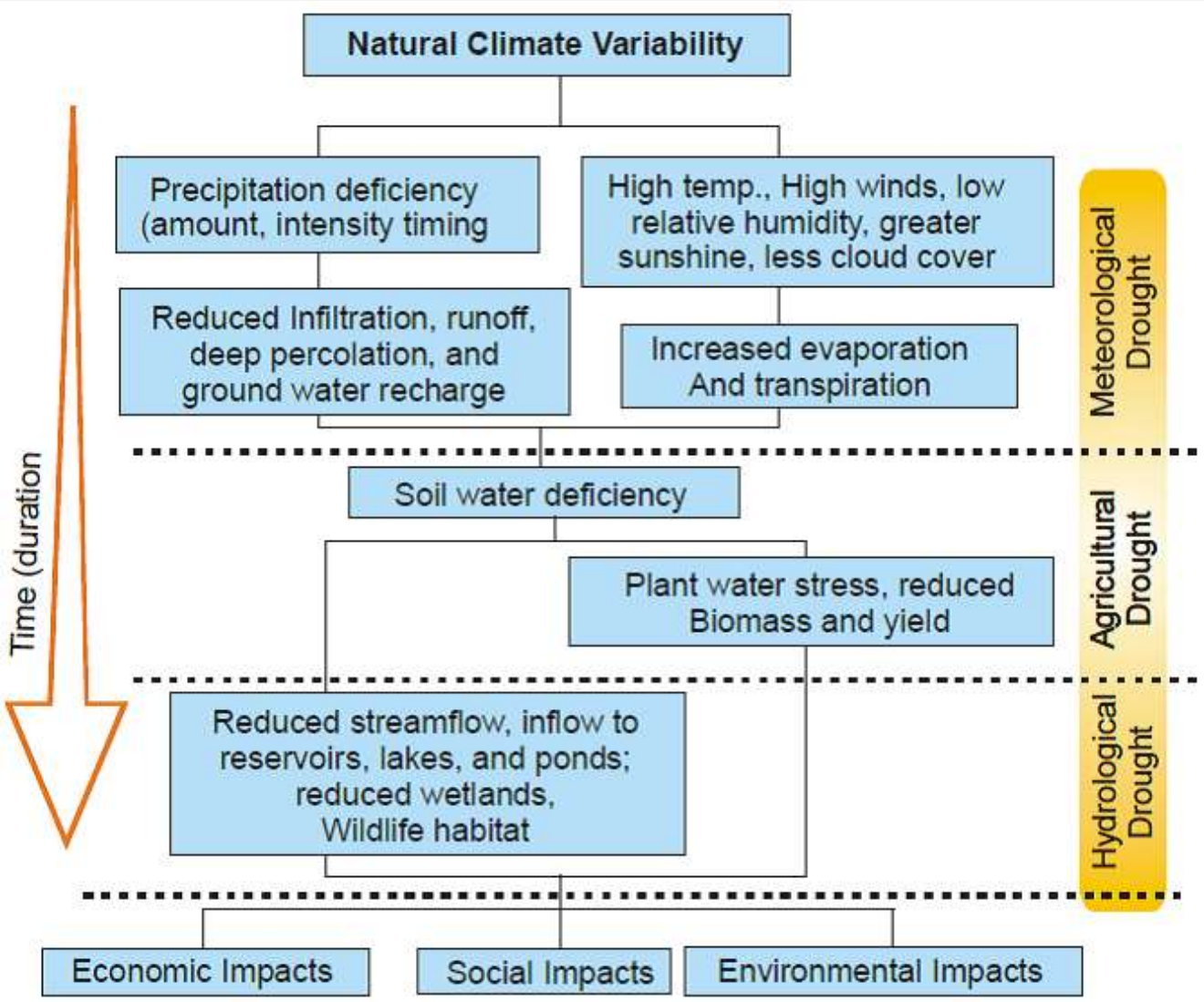
Remote Sensing & Satellite Meteorology

Introduction

- There are more than 150 published definitions of drought;
- The definitions reflect differences in regions, needs, and disciplinary approaches;
- *According to Wilhite and Glantz there are four basic approaches to measuring drought:*

- *Meteorological,*
- *Agricultural,*
- *Hydrological,*
- *Socioeconomic.*

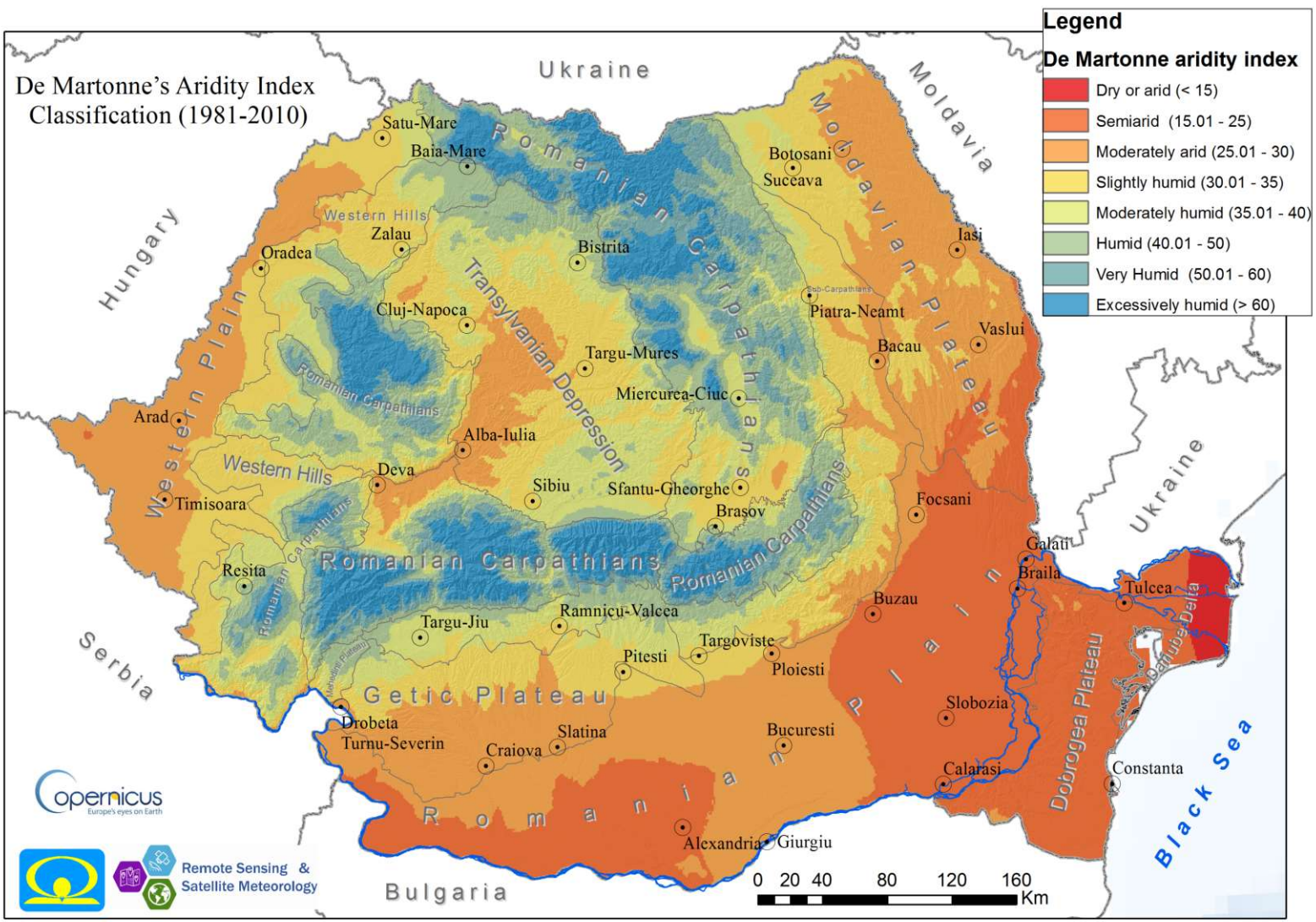
- Drought is an important phenomenon, which influences agricultural processes. It may have negative impact on crop yields and in extreme cases a loss of a harvest or of livestock, therefore need to be carefully monitored.



Types of drought according to Wilhite and Glantz (Source: NDMC)

Drought prone areas in Romania

- De Martonne Aridity Index identifies, based on precipitations and temperatures, areas with different types of climate. In Romania, the dry and semi-arid areas are more prone to drought more than others. Those areas are also the main agricultural production zones in the country. Total agricultural surface of Romania is 14.6 million ha, from which only 470.000 ha was irrigated at least once in 2020.



Sentinel-1 A/B

- C band SAR
- 2 satellites
- +2 from 2022

Sentinel-2 A/B

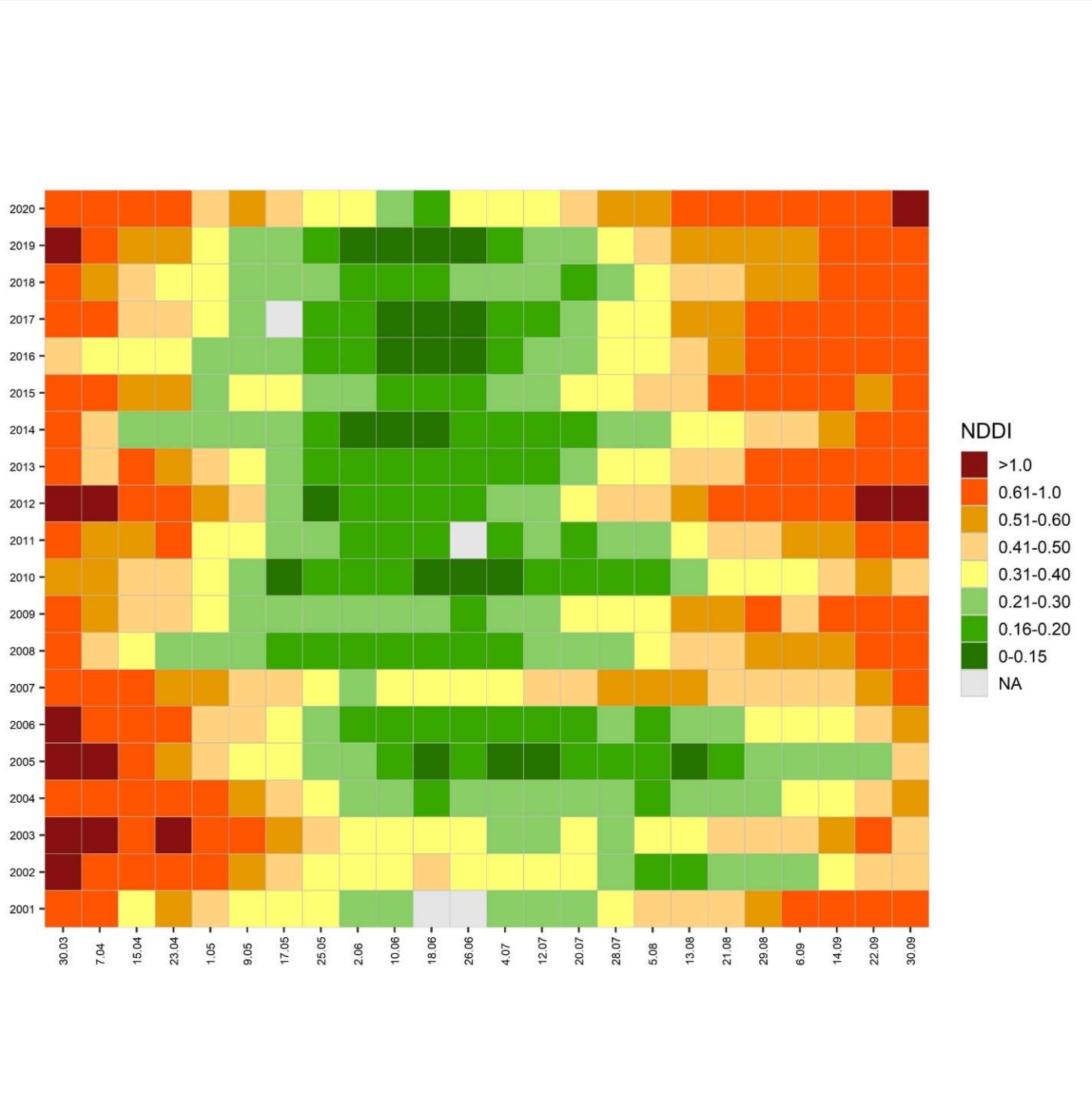
- Multispectral Sensor
- 2 satellites
- 13 spectral bands
- VIS, NIR, SWIR
- +1 from 2024

Sentinel-3 A/B

- 4 main instruments
- OLCI, SLSTR, SRAL, MWR
- 2 satellites
- +2 from 2024

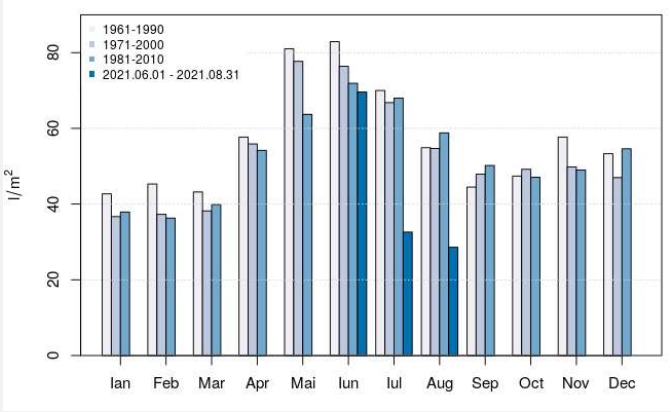
Past and future work

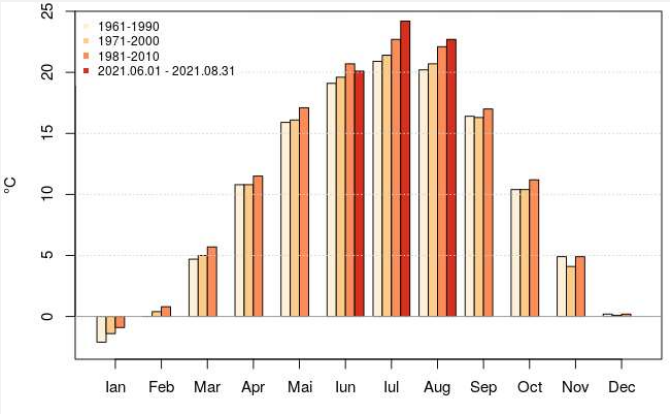
With over 20 years of past observations MODIS data was used to compute 8 days synthesis NDDI. Computed on a agricultural scale over entire Romania territory, NDDI give an image of the shift in drought patterns, in the first period with droughts more accentuated in the spring months and later on with drought more accentuated in the late summer, early autumn months. With the increasing archive, but also satellite numbers, of Sentinel 3 this approach will be used also in continuation of drought monitoring.

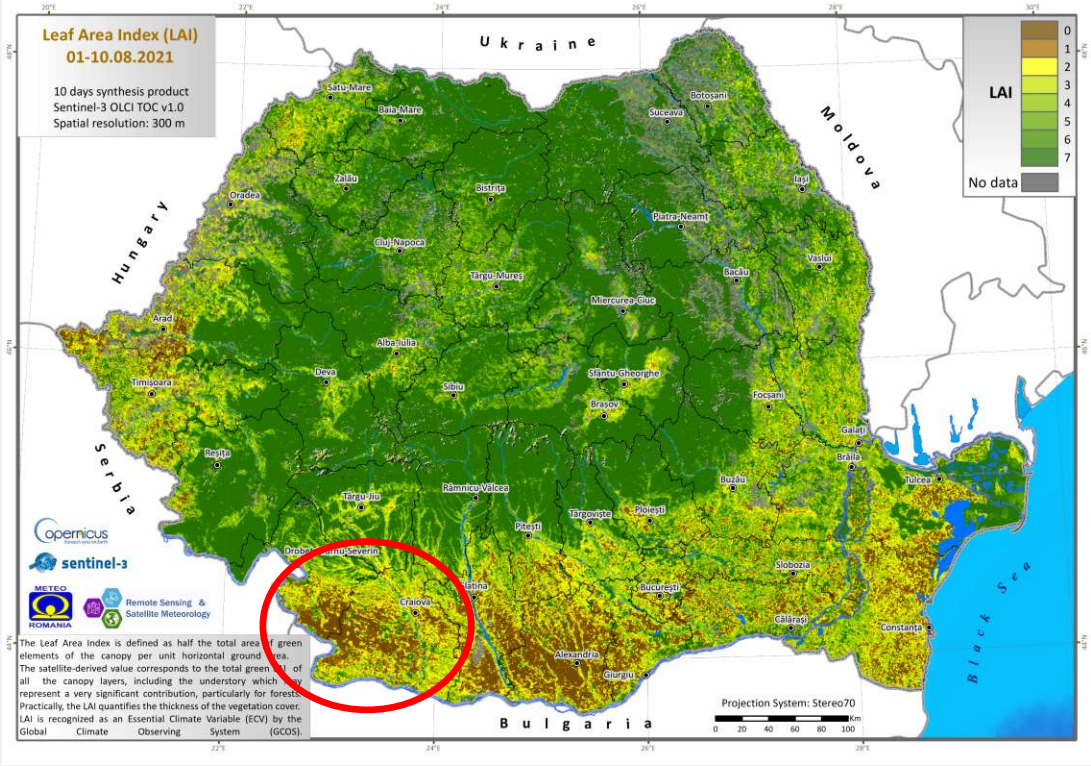


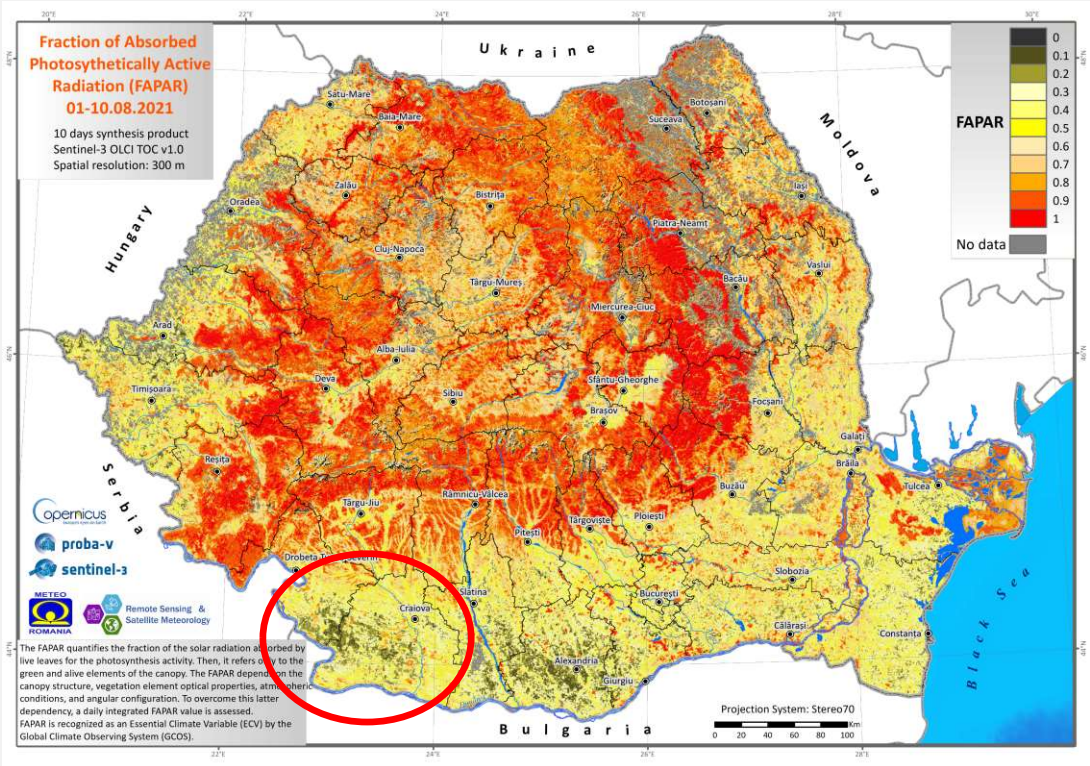
Vegetation indices

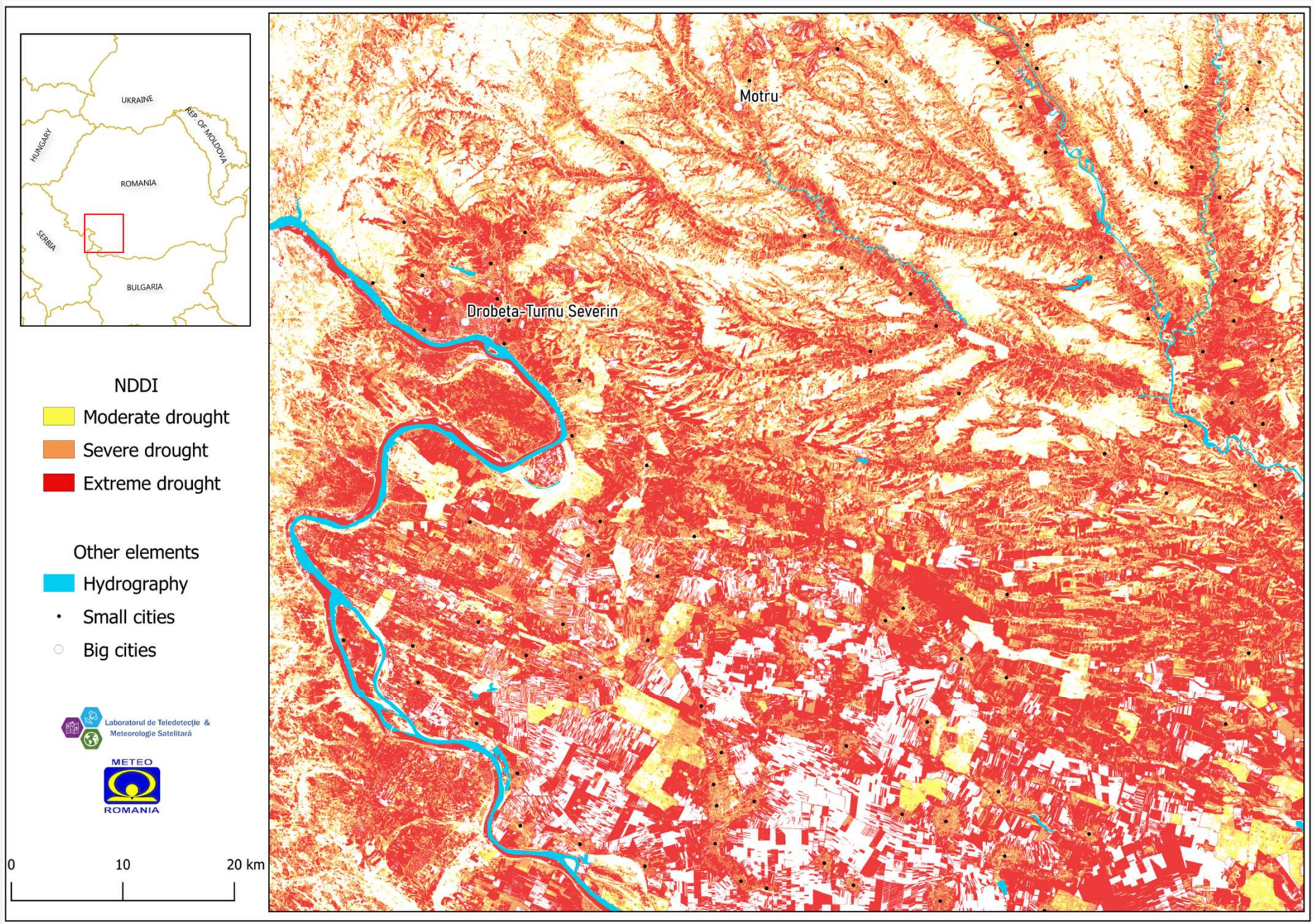
Vegetation indices or biophysical parameters such as LAI and FAPAR, derived from Sentinel 3 OLCI data are ingested in CGLS platform on a decadal scale. Near-real time as the exemple provided or consolidations (decadal observations based on past data and gap filling techinques) are used as proxies to identify prone areas to drought and vegetation stress as a response to climatic conditions.



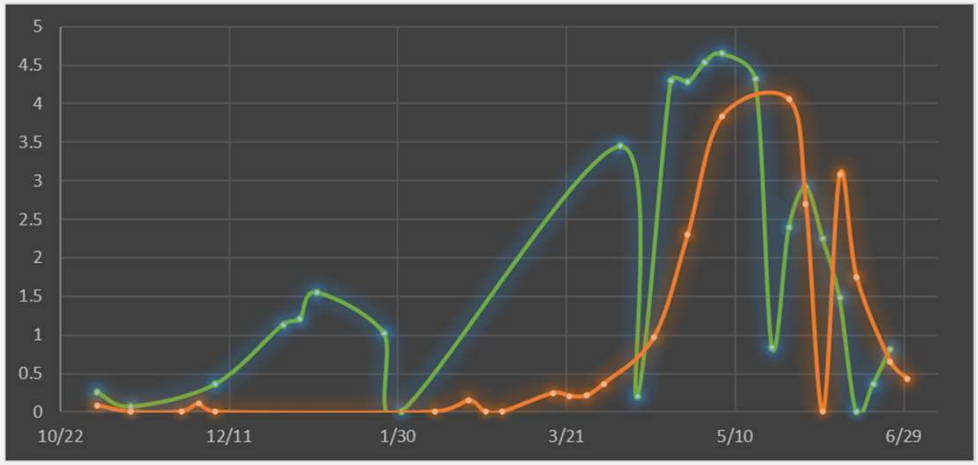


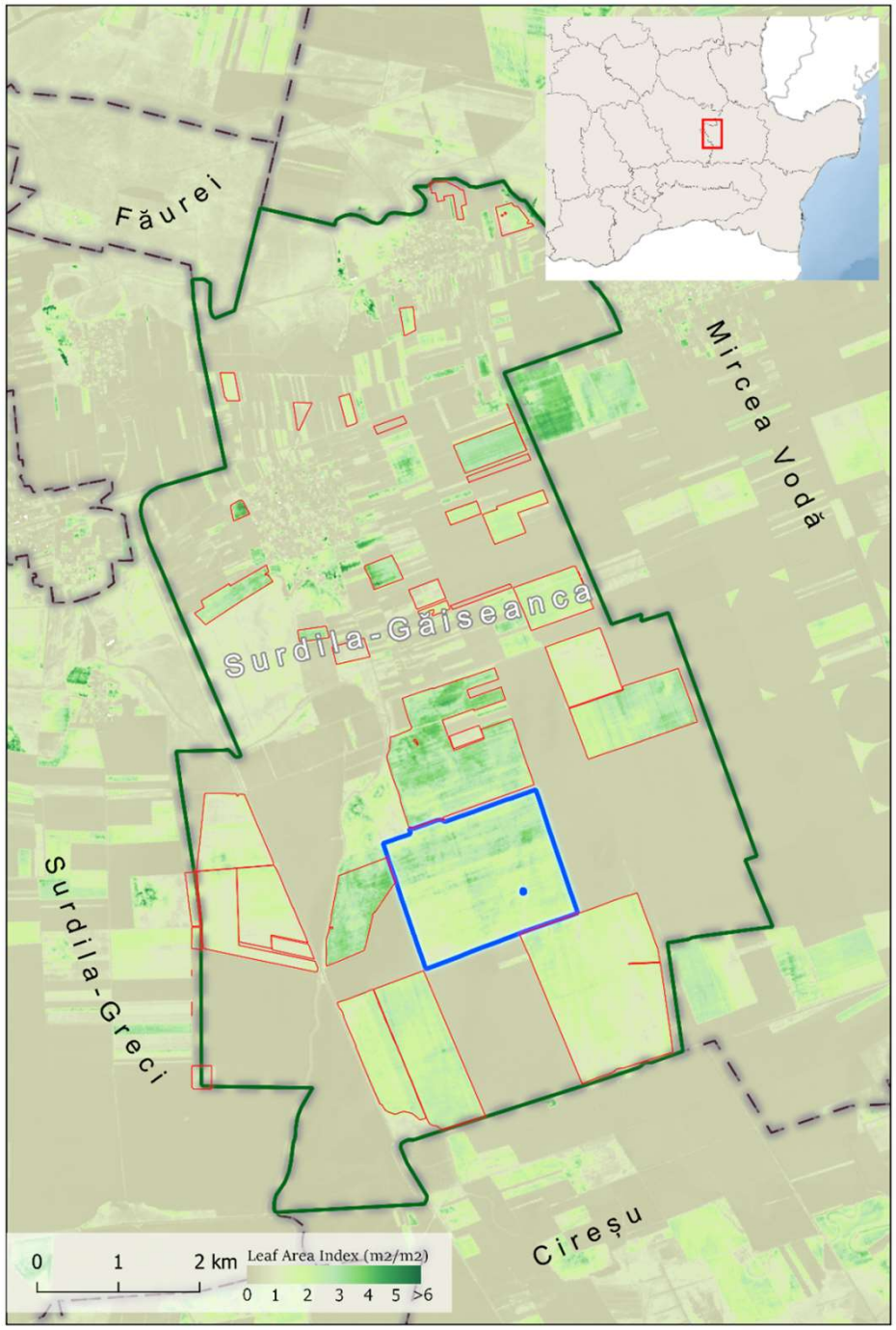





UKRAINE
REP. OF MOLDOVA
HUNGARY
ROMANIA
SERBIA
BULGARIA
Motru
Drobeta-Turnu Severin
NDDI
Moderate drought
Severe drought
Extreme drought
Other elements
Hydrography
Small cities
Big cities
Laboratorul de Teledetecție & Meteorologie Satelitară
METEO ROMANIA
0
10
20 km

- A more detailed activity is underway for certain plots with cultivated background, here LAI data in a principal agricultural area of Romania. Two years were compared, agricultural year 2017-2018 and 2018-2019, to identify possible stress that vegetation had been affected by.

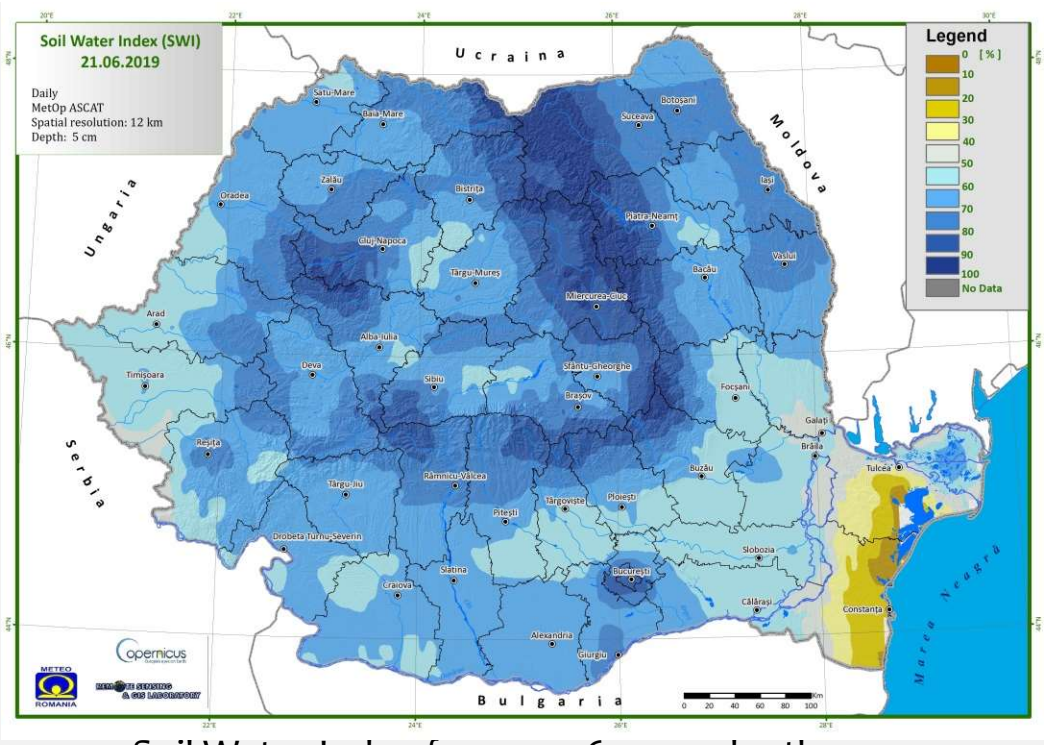




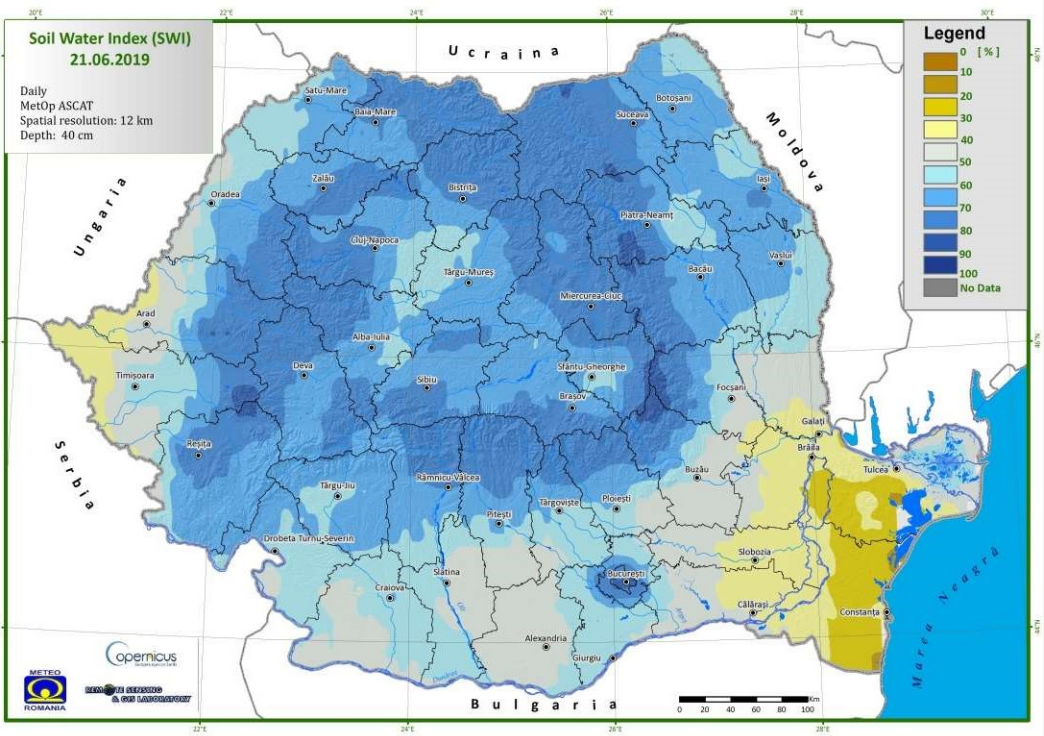
Soil Water Index (SWI) with 12.5 km resolution

Depth:

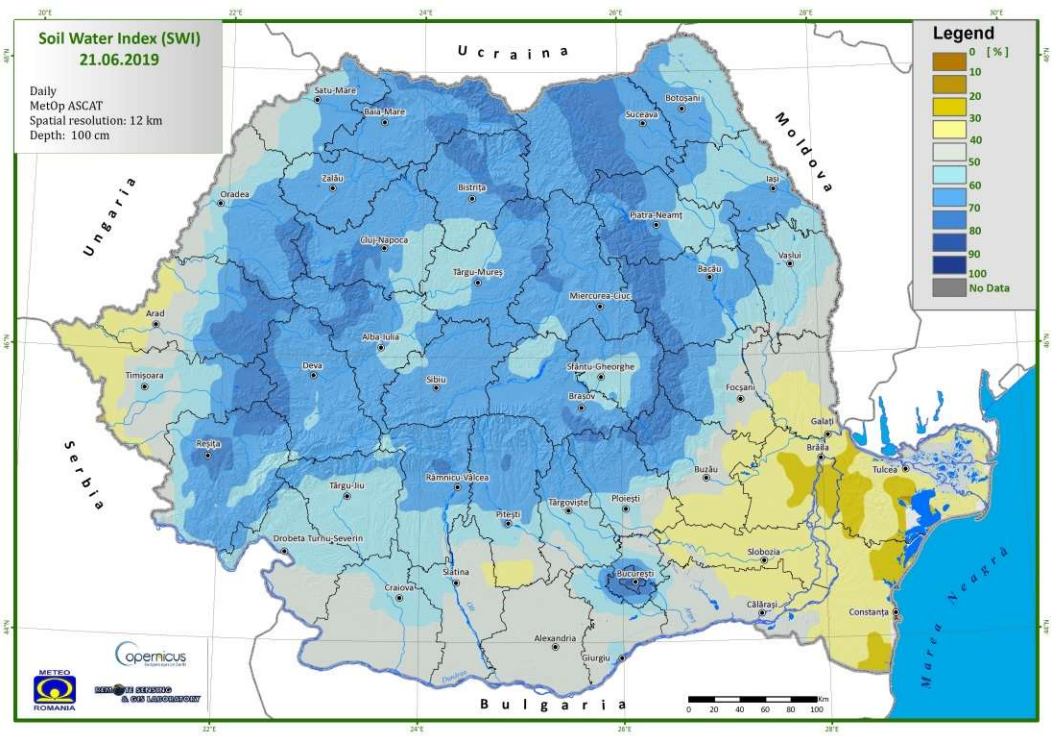
1 cm	20 cm
5 cm	40 cm
10 cm	60 cm
15 cm	100 cm



Soil Water Index from 21.06.2019, depth 5 cm



Soil Water Index from 21.06.2019, depth 40 cm

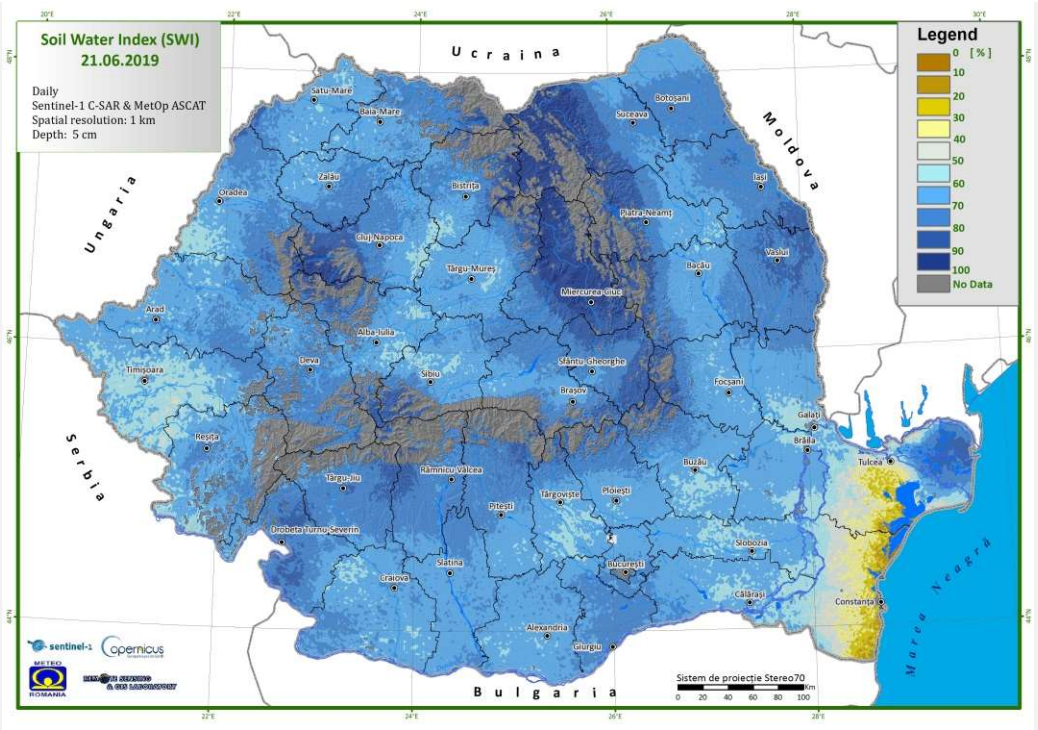


Soil Water Index from 21.06.2019, depth 100 cm

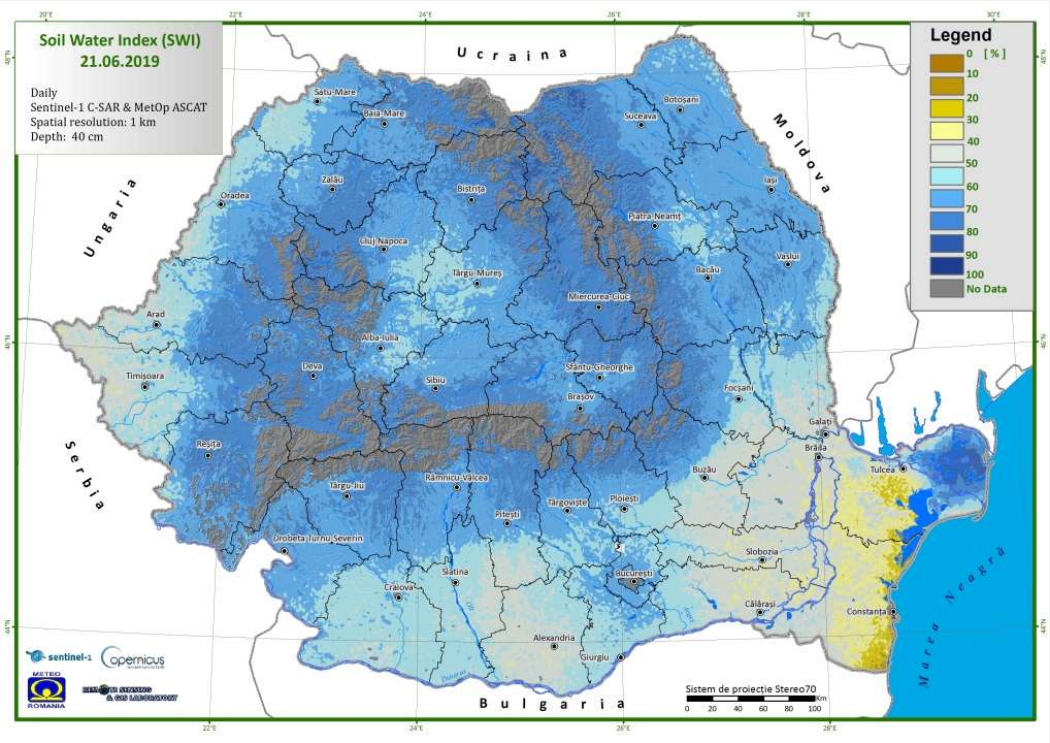
Soil Water Index (SWI) with 1 km

Depth:

2 cm	20 cm
5 cm	40 cm
10 cm	60 cm
15 cm	100 cm



Soil Water Index from 21.06.2019, depth 5 cm



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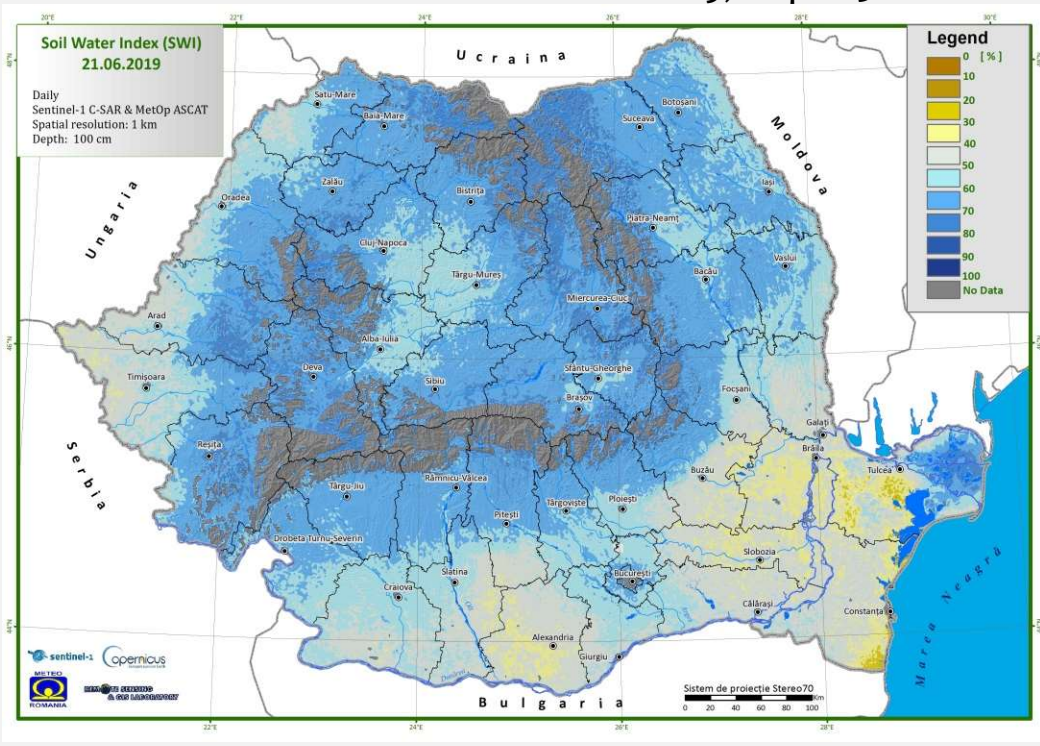

Soil Water Index from 21.06.2019, depth 100 cm

Integrations on SWI volumetric values in a platform for farmers