MAPPING OF SOIL MOISTURE DERIVED FROM SMOS DATA OVER THE SOUTH OF ROMANIA

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ABSTRACT

The present study focused on the use of SMOS data for drought monitoring over two counties in Romania, namely Dolj and Constanta. The research integrates data acquired by the SMOS Level 2 processing. The study demonstrates the relevance of Earth Observation data for sustainable agriculture management and may bring societal and environmental benefits the potential and users: farmers, water management authorities, etc.

INTRODUCTION

In this study the soil moisture was monitored based on satellite data over the south of Romania in the counties of Dolj and Constanța. Dolj county contains one of the most arid areas of our county due to very high temperatures, low precipitations and sandy soil. This particular area is located in Dabuleni city, the so-called Romanian desert. Constanta county has moderate temperatures and it was considered as reference test area within the study.

OBJECTIVE

The main objective of this study was to use SMOS satellite data to monitor soil moisture as indicator for drought in Romania. The second objective was to compare soil moisture derived from SMOS data with 25 kilometers spatial resolution for two different counties Dolj and Constanta in terms of meteorological conditions temperature and precipitation, in a time frame of two consecutive years, namely 2016-2017.

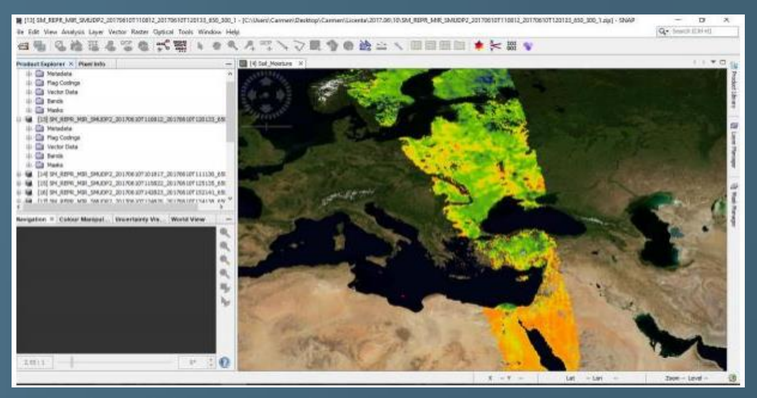
METHODS

The data acquired by the SMOS satellite is global, with a 3-days visiting time and 4% volumetric soil moisture accuracy. SMOS level-2 products © ESA 2018 provided by the European Space Agency were used in this study. The SMOS products corresponded to days 1, 10 and 20 of each month, from May to September, 2016-2017. When opened in SNAP/SMOS Toolbox, the SMOS level-2 products appear as "strips" that cover different areas on the globe. Therefore, the first step consisted of the identification of the products corresponding to the Romanian territory. Next, using ArcMap and a GIS vector layer containing the boundaries of the Romanian counties, the SMOS images were cropped in order to obtain the data corresponding to the test counties, namely Dolj and Constanta.

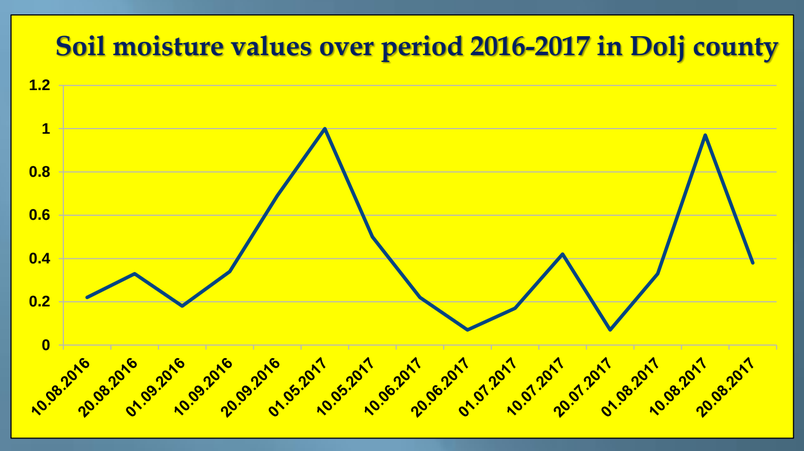
RESULTS

The study enabled the soil moisture monitoring for the selected test areas. Accordingly the highest and lowest soil moisture values could be identified. Tle lowest soil moisture value of 0.07 was registered in Dolj county on the June 20th, July 20th 2017, and the highest soil moisture value of 1.00 was registered in the same county on May 1st 2017.

Location of test areas Dolj and Constanta counties in Romania

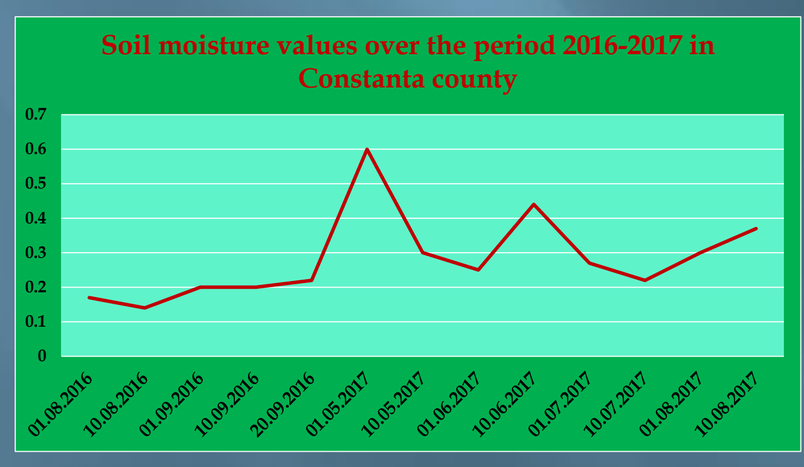


Selection of the SMOS data © ESA 2018 for Romania using the SNAP/SMOS Toolbox



The maximum value was recorded on May 1st 2017, and the minimum on June 20th July 20th 2017

County	Aqcuisition date	Soil moisture
Dolj	10.08.2016	0.22
Dolj	20.08.2016	0.33
Dolj	01.09.2016	0.18
Dolj	10.09.2016	0.34
Dolj	20.09.2016	0.69
Dolj	01.05.2017	1
Dolj	10.05.2017	0.5
Dolj	10.06.2017	0.22
Dolj	20.06.2017	0.07
Dolj	01.07.2017	0.17
Dolj	10.07.2017	0.42
Dolj	20.07.2017	0.07
Dolj	01.08.2017	0.33
Dolj	10.08.2017	0.97
Dolj	20.08.2017	0.38

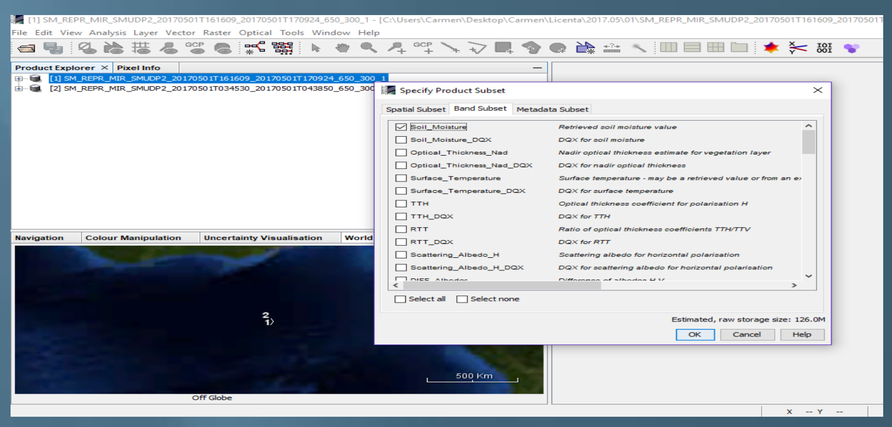


The maximum value was recorded on May 1st 2017, and the minimum on August 10th 2016.

County	Acquisition date	Soil moisture
Constanta	01.08.2016	0.17
Constanta	10.08.2016	0.14
Constanta	01.09.2016	0.2
Constanta	10.09.2016	0.2
Constanta	20.09.2016	0.22
Constanta	01.05.2017	0.6
Constanta	10.05.2017	0.3
Constanta	01.06.2017	0.25
Constanta	10.06.2017	0.44
Constanta	01.07.2017	0.27
Constanta	10.07.2017	0.22
Constanta	01.08.2017	0.3
Constanta	10.08.2017	0.37

Soil moisture statistics obtained by processing data from the SMOS satellite.

The lowest soil moisture value in 2016 was recorded in Constanța county on august 1st , being 0.14, with the highest value being 0.22 on september 20th of the same year. In Dolj county, on september 1st 2016, the value of 0.18 was the lowest and on the 20th of the same month the highest soil moisture value of that year was 0.69. In 2017, the lowest value, 0.07 was registered in Dolj county, being present on the 20th of June and July, and the highest in the same county was 1.00 on May 1st . The highest value of 0.60 was recorded on May 1st , 2017 and the lowest was 0.22 on July 10th of the same year.



Selection of the SMOS data © ESA 2018 for Romania using the SNAP/SMOS Toolbox

CONCLUSIONS

In conclusion, the use of level-2 SMOS satellite data for two different counties in Romania enabled the successful monitoring, analysis and comparison of their soil moisture for two consecutive years (2016-2017), from May until September.

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