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MONITORING OF SOIL RESOURCES USING SENTINEL IMAGES

*Nicoleta-Viorela **IURIST (DUMITRAȘCU)** –Ph.D Student, Eng., „Gheorghe Asachi" Technical University of Iasi, Faculty of Hydrotechnical Engineering, Geodesy and Environmental Engineering, nicoleta.dumitrascu@tuiasi.ro*

ABSTRACT

The aim of this study is to create a geodatabase about soil resources, using satellite images and Soil Resources Map at 1:10000 scale. In the framework of the study we analyzed the evolution of land use and land cover for the study area in recent decades, using Sentinel optical images.
The Soil Resources Map, in analog format was scanned, georeferenced and digitized. The results obtained from satellite images will be compared with the data on soil map used as reference.
In this study, we also have delineated the land surface of Galati County that was affected by floods in October 2016. For this case study, Sentinel-1C-Band SAR data were used.

INTRODUCTION

Nowadays, the satellite images are increasingly used in agriculture in various applications like mapping the agricultural crop types, crop monitoring and damage assessment etc.
Monitoring the areas affected by flooding and damage to property assessment, represents an important step in managing crisis situations. In order to monitor and estimate flood damages in near-real time, numerous techniques can be used, from a simply digitizing on maps, to using detailed surveys or remote sensing techniques.

OBJECTIVE

The study area is centered at N45°50′, E27°56′, which is in the South-Est of Romania, in Moldavia region, Galati county. The data used in land cover study was downloaded for free from ESA Hub. The acquisition date was 28 September 2016, at 01:10 p.m. The satellite images used to delineate the land surface of Galati County affected by floods were captured by satellite Sentinel 1B, in 08 October 2016 and 15 October 2016.

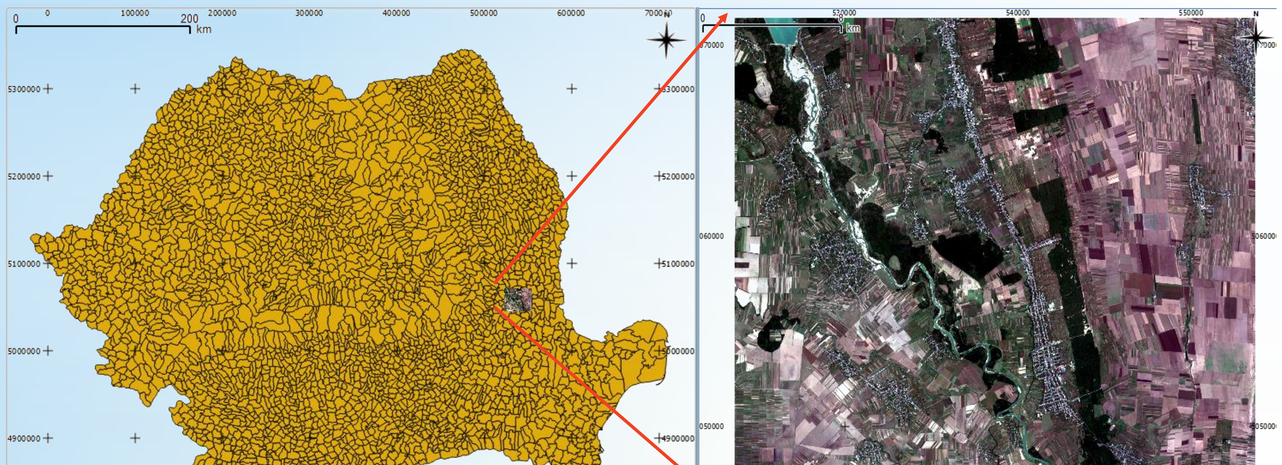


Figure. 1 *Study area*

METHODS

The unsupervised classification was performed using SNAP software, while the NDVI and supervise classification was performed using QGIS software, SCP plugin. Supervised classification was achieved by using methods like: Minimum Distance, Maximum Likelihood and Spectral Angle Mapping. The Toolbox Sentinel-1 of the SNAP software was utilized to pre-process the SAR images and the following steps were applied: Calibration, Thermal Noise Removal, TOPSAR- Deburst, Speckle- Filter.

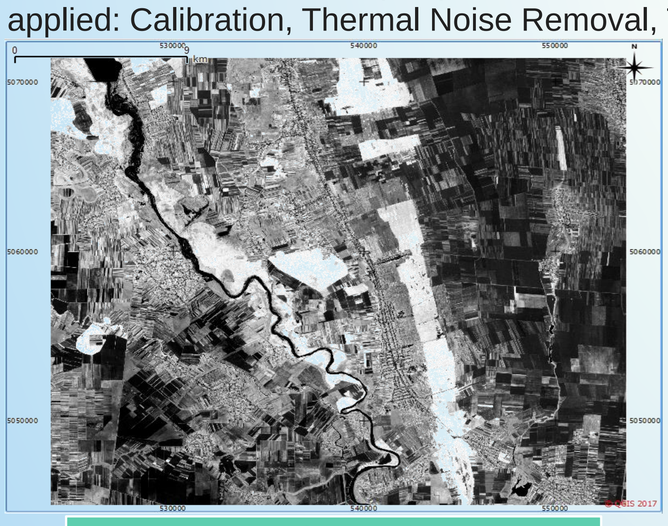


Figure. 2 *NDVI of the study area*

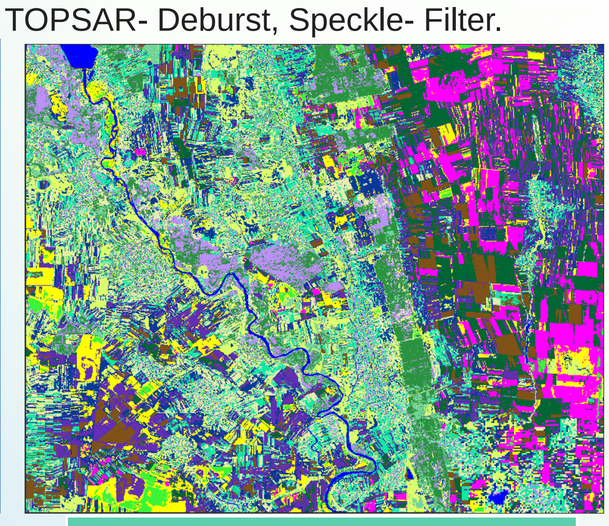


Figure. 3 *Unsupervised classification K-means method*

RESULTS

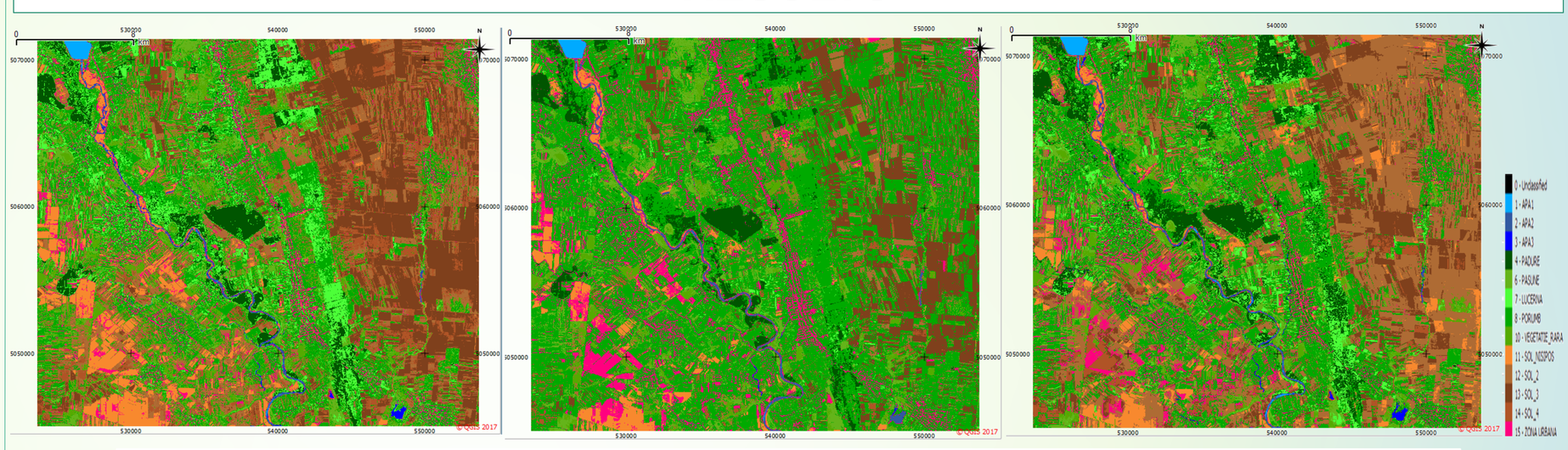
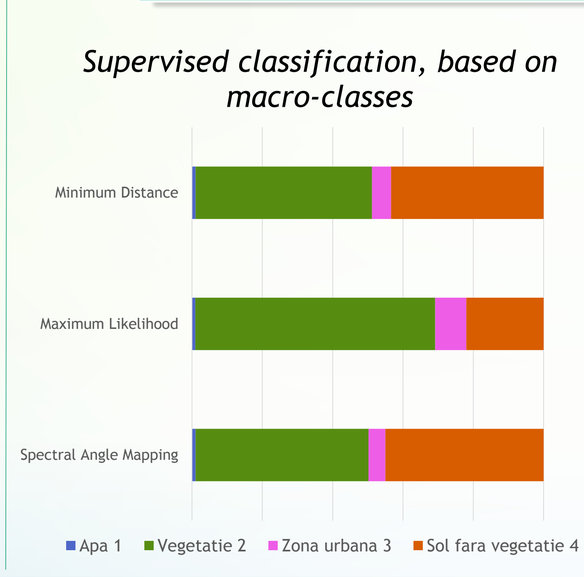


Figure. 4 *Supervised classification, based on classes, using a)* Spectral Angle Mapping; b) Maximum Likelihood; c) Minimum Distance.



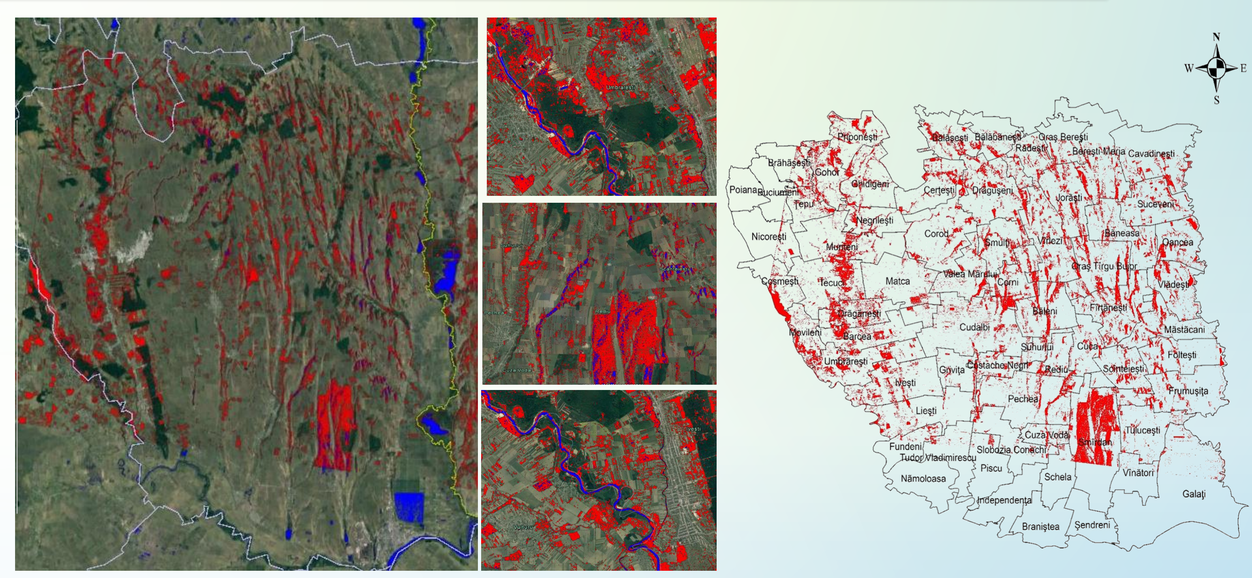


Figure. 5 *Area covered by water*

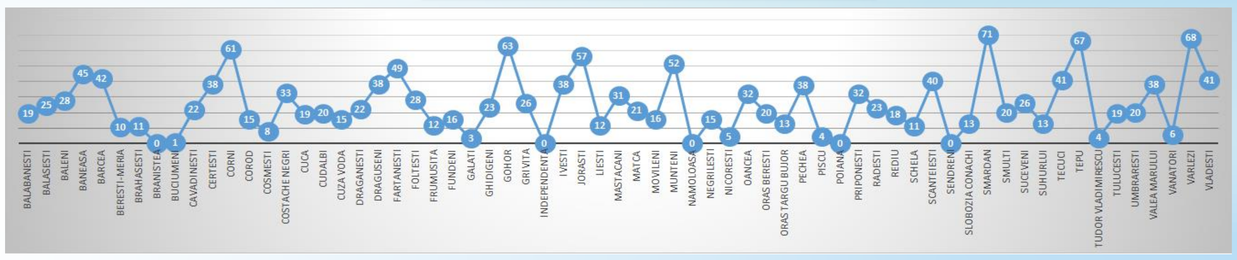


Fig. 6 *Percentage of communes area covered by water*

DISCUSSION and CONSLUSIONS

Optical imagery can be used to determinate and analyze land cover and land use, along time, using different methods.
The results of supervised classification, using macro-classes and classes, are similar for Minimum Distance Method and Spectral Angle Mapping Method. Macro-class that represents surfaces covered by water, occupy 1% of the study area, vegetation represents around 50%. The urban area represents 5% from the area, while naked soil is around 45%.
Sentinel-1 provides images of the Earth's surface regardless of weather conditions, day or night and have a capacity of 6-day revisit, providing information in various fields, from monitoring the effects of floods up to monitor ice from polluted waters.
The floods that took place in 10-12 October 2016 have affected more than a quarter of the county, about 120000 ha. The most affected commune from Galati county were Smardan, Varlezi, Pechea, Munteni, Tecuci.

FURTHER RESEARCH

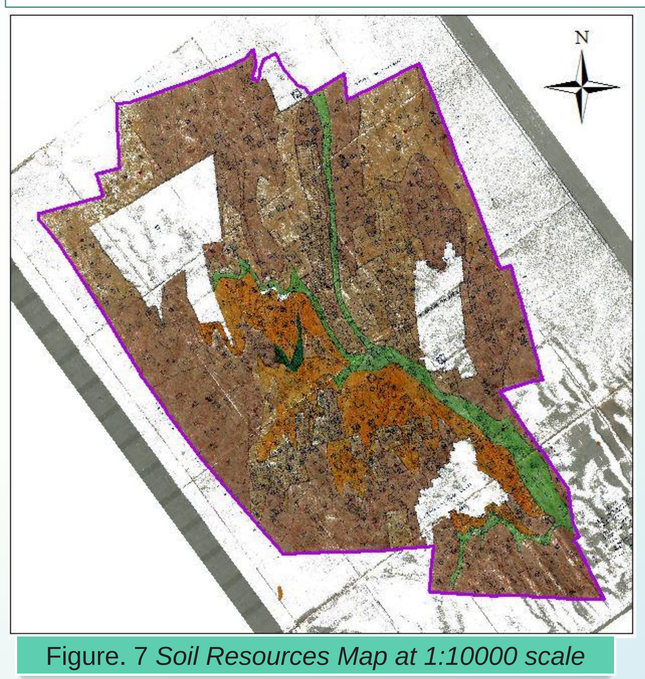


Figure. 7 *Soil Resources Map at 1:10000 scale*

The Soil Resources Map, in analog format was scanned, georeferenced and digitized. We have created a geodatabase about soil resources, using Soil Resources Map at 1:10000 scale.

In further research, the results obtained from satellite images will be compared with the data on soil map used as reference. Using remote sensing data and techniques , we will estimate the soil erosion, using the Digital Terrain Model and Sentinel and Landsat images. We will also analyses the soil moisture using Sentinel-1 satellite images.