The use of satellite images in the morphological analysis of the Siret riverbed between Cosmești and Galați

Diana Alexandra Marola
Doctoral School “Simion Mehedinți”
Faculty of Geography, University of Bucharest
Bucharest, Romania
dianaalexandramarola@gmail.com

Laura Comănescu
Department of Geomorphology, Pedology - Geomatics
Faculty of Geography, University of Bucharest
Bucharest, Romania

Abstract— The objective of this work consists in identifying the changes produced in the Siret River, using satellite images.

The study area is represented by a sector of the Siret Plain, heavily influenced by the dynamics of the Siret River reflected in morphology, landscape features, land use, and anthropogenic elements.

The working methodology consisted in combining the techniques of remote sensing and GIS in the processing of satellite images Landsat 7 ETM and OLI L8 from 2003 and 2016, aiming the classification of this images according to a few categories of land use in order to observe the dynamics of their distribution in space and time. The main categories of use of land on which we have focused the analysis are located in close proximity to bodies of water. To process images in different spectral bands combinations and vector analysis, we used ArcGis application and related modules.

The results of the analysis of satellite images based on processing, are represented by small differences identified between the categories of land use in the proximity of the Siret River within the area studied, between the years of 2003-2016.

Keywords— GIS; satellite images; land use

I. INTRODUCTION

This project aims to use satellite imagery for obtaining advanced information related to changes of the relief, geographical elements, and changes of function of the landscape.

The area of study is a low plain area, influenced, in particular, by the dynamics of its main element, the Siret River Valley. The Siret River Dynamics has a major influence on the characteristics of landscape and anthropogenic elements.

II. AREA OF STUDY

The studied area is located between Cosmești (North) and Galați Municipality (South) and is located at the contact of the four counties, namely: Vrancea County (Northwest), Galați County (North and East), Brăila (South) and Buzău (Southwest). The position of the area studied is apparent in the following figure:

Fig. 1. The location of the studied area

III. DATA AND METHODOLOGY

The methodology used for the analysis was based on the identification of several categories of land use on both satellite images, in order to observe the dynamics of their distributions in space and time. The processing software used to analyze the images and to extract the relevant information, were SNAP and ArcGis.

There were used only those combinations of bands which were considered more relevant in accentuating the relevant information for this study. Also, it was used a certain type of pixel classification to represent the distribution of the categories of land use establish.

Basically, there were obtained certain classifications of pixels, which represent operations based on mathematical algorithms, obtained in digital environment, in order to group pixels with different spectral signature from an image or to group those pixels for which it is known their signification in the field.

Within this phase, it could have been used either an unsupervised classification or a supervised classification. An unsupervised classification means that the value of the pixel it is not known, and involves a differentiation of pixels depending on the spectral signature. For this study, it was chosen the supervised classification which is based on the fact that the analyst knows the significance on the field of the spectral signature corresponding to the pixels in the image.

Before the classification itself, there were chosen a series of groups of pixels with known meaning, as homogeneous in terms of spectral signatures depending on which all pixels in the image will be grouped into categories. This groups shall be called test areas or regions of interest. The same areas of interest have been selected in both images processed, in order to have a correct development of the dynamics of their distribution.

The regions of interest for this study were:

- Water bodies;
- Silt;
- Forests;
- Areas of transition with shrubs;
- Pasture;
- Vineyards;
- Human settlements;
- Agricultural land.

The next step was the actual realization of the classification on the imagery chosen, stage which involves running some mathematical algorithms centered on the test areas for comparison and analysis of the pixels in order to group them in different classes. There are several types of classifications supervised, but the method chosen was a Maximum Likelihood Classification that uses the principle that each cell chosen from each class is distributed normally. So, for each satellite image, it was used a certain combination of bands, the areas of interest were chosen and the supervised classification of the image has been carried out using the specified method.

Subsequently, it was extracted a range of statistical information from previously completed transactions, representing practically the main purpose of this study.

Fig. 2. Maximum Likelihood Classification

IV. RESULTS

The results of the analysis of satellite images based on processing, are represented by small differences identified between the categories of land use in the proximity of the Siret River within the area studied, between the years of 2003-2016.

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