USING GIS TECHNOLOGY IN HYDROGEOLOGICAL ANALYSIS

CAMELIA SLAVE[1], IOANA VIZIREANU[2]

[1.] *University of Agronomic Sciences and Veterinary Medicine, M r ti no 59, Bucharest 011464, Romania*
[2.] *National Institute for Aerospace Research "Elie Carafoli" - INCAS , Iuliu Maniu, no 220, Bucharest 061126 , Romania*

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ABSTRACT

The main purpose of this study was to present a hydrological model to a meadow area of the Danube.
GIS tools has multiple for the achievement thematic maps that can model various processes. The methods are based on topographic characteristics of the land and river characteristics existing in the neighborhood .For this area maps were created using the program ArcMap10.1.

INTRODUCTION

For over 20 years it was adopted the United Nations Framework Convention on Climate Change. The aim of this convention is to establish a global framework on climate change.

Its objective is: "Achieve stabilization of greenhouse gas concentrations in the atmosphere at level emissions to prevent dangerous anthropogenic interference with the climate system. This level will be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, so that food production is not threatened and economic development to take place in a sustainable manner. "

In December 1997 it took place the third Conference of Parties in Kyoto, Japan. The conference represented a new approach to climate change from a global perspective. The Conference urged the parties to take binding commitments to limit emissions of GHGs to a quota. Romania has signed the Kyoto Protocol in 1999 and ratified in January 2001 by Law 3/2001, being the first country to do so. Government Decision 645/1996 is established through the National Commission on Climate Change, and by Government Decision 645/2005 be adopted National Strategy on Climate Change.

Once Romania joins the European Union on 1 January 2007 is required to take into account the requirements of its global change concerns into development of future environmental policy.

Worldwide there is a rise in temperature of 0.76^0C compared with 1850. And the lack of effective environmental policies in relation to global changes that will lead to between 1.8 to 4 ^{0}C by 2100, according to our forecasts - Fourth Assessment Report of the Intergovernmental Panel on Climate Change. This increase is the highest recorded since the beginning of the industrial era to the present.

Also in this report are cautioned that "warming of the climate system is unequivocal, already apparent in the comments on the increase in global average temperature of the air and oceans, expanding the melting of snow and ice, as well as raising average global sea.

At the same time it highlights the problems due to air pollution with direct consequences for global warming. There was an increase in global temperature due to accumulation of atmospheric gases such as carbon dioxide. Reduce heat dissipation carbon dioxide from Earth but does not block sunlight. This increase in carbon dioxide levels has negative effects on agriculture.

According to statistics global land area is occupied 1/3 of the dry zone, about 37.6 million km2, the annual increase is 70,000 km^2, one sixth of the world population is

affected. The land covers 40% of the land area and is inhabited by 15% of the world population. 25% of the land is affected by different land degradation processes. Area affected by desertification occupies 36% of the continent of Africa, 25.4% of Central and North America, the rest in Europe and Australia. In Europe affected by desertification are 10 Member States of the European Union.

Romania has 14.7 million hectares of farmland, of which 9.4 million hectares are arable land. It also notes that 7 million hectares of agricultural land are affected by drought and 4 million ha are affected by excess moisture. Droughts affect crop production and causes a reduction in agricultural output of 30- 50%.

The land use, table 1 and table 2

- Thousands ha-

Tabel 1 Land use

Specification	2007	2008	2009	2010	2010*	2011	2012
Agricultura rea, of wich:	14709,3	14702,3	14684,9	14634,5	13306	14621,5	14615,1
Arable	9423,3	9415,1	9422,5	9404,0	8306	9379,5	9392,3
Pastures	3330,0	3330,0	3313,8	3288,7	4506	3279,3	3270,6
Rough	1531,4	1532,4	1528,0	1529,6	4506	1554,7	1544,9
Vineyard	218,0	214,5	215,4	213,6	312	211,3	210,5
Orchards	206,6	207,3	205,2	198,6	312	196,7	196,8
Family gardens	-	-	-	-	182	-	-

Tabel 2 Irrigation

Specification	2007	2008	2009	2010	2011	2012
Irigations area	2997	2997	2997	2997	2997	2997
Irigation area from ANIF	320,2	257,7	296,8	83	103,3	161,3
% from irigation area	10,6	8,6	9,9	2,7	3,4	5,4

Drought is a natural phenomenon caused by rainfall below those standards. Given the long periods without rainfall, high temperatures and low relative humidity atmospheric drought occurs. Lack of rainfall leads to lower water reserves in the soil and soil drought installation. In the case where the two types of drought combine these give rise to agricultural drought. Drought may compromise agricultural crops. Globally because of the changes that have occurred through rising temperatures, decrease in precipitation led to an increase in agricultural areas affected by droughts.

Another consequence of climate change is the soil degradation. This phenomenon manifests itself through erosion by water or wind erosion. Combating this phenomenon is achieved by hydro works.
Drought is a phenomenon that can be characterized: meteorological, hydrological, economic and social.

MATERIALS AND METHODS
For the realization the hydrological modeling using GIS technology was used ArcGIS 10.1 software and its ArcView Spatial Analyst extension.
ArcView Spatial Analyst provides opportunities for modeling and visualization aspects of the hydrology of an area. It can model the flow direction, flow accumulation and flow length, it demonstrates that ArcView Spatial Analyst is an important tool for spatial modeling.

For the realization the hydrological modeling was chosen D buleni area - Potelu Corabia, which belongs to Olt County area (Figure 1). The area is present follows land use.

- The special protection area at D buleni Sands is located in Olt - 74% and 26% in Dolj;
- The land is used for agricultural purposes 52%, 22% snuffling forest, wetlands (rivers, lakes) 10% and pastures 16%;
- The geographical area belongs to the Plain Romana ilor subdivision Oltenia Plain and has a high terrace that descends to the Danube and side stepped the Jiu River;
- In terms of geological sedimentary rocks are present - marl, clay, sand and a layer of loess;
In the meadow meets a dune relief;
- In the common area is an area D buleni lifeless dunes and sandstorms, this phenomenon of deflation is favored by the wind;
- The area has a climate with high annual average temperature (10-11 ^{0} C), the temperature values are the highest in the country, precipitation has ranged between 450-600 mm / year;
- The rivers that cross this territory are rivers from the southern and eastern group are all tributaries of the Danube. Jiu and Olt are the most important rivers tributaries Motru, Amaradia, and Oltet. The Danube valley has temporary swamp in period with high levels.
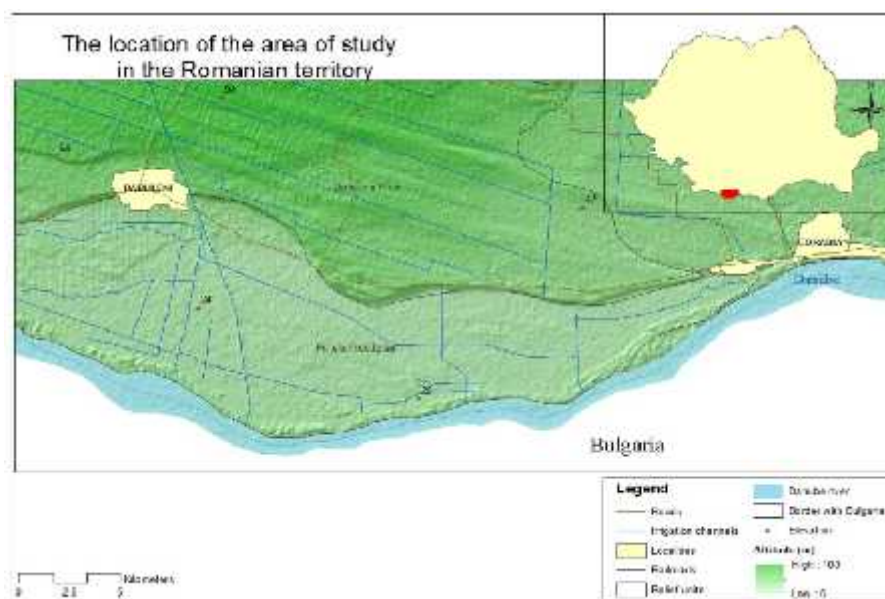

Figure 1. The study area map

There were used cartographic materials for database achievement, such as topographic map with contour lines on scale 1:25000 that was processed by scanning and geo-referencing in Stereographic 1970 projection system. The digital elevation model (DEM) on 90 meters spatial resolution, available free of charge on CGIAR-CSI geoportal in WGS84 geographical projection, was initially transformed in Stereographic 1970 projection. This 90 m DEM was re-interpolated and exported to obtain an appropriate resolution of 30 m, required for analyzing the study area. The correction of the SRTM model was done in Arcview, using Spatial Analyst especially. Based on this 30 m DEM, we could define the relief units more accurate and thus to derive morphometric parameters, slope and relief declivity. Also we could create the relief hillshade used for 3D effect view of the relief. This hillshade may overlap other layers with a transparency of 40-50 %. The hildshade maps depict the brightness of terrain reflections surfaces. (Figure 2)
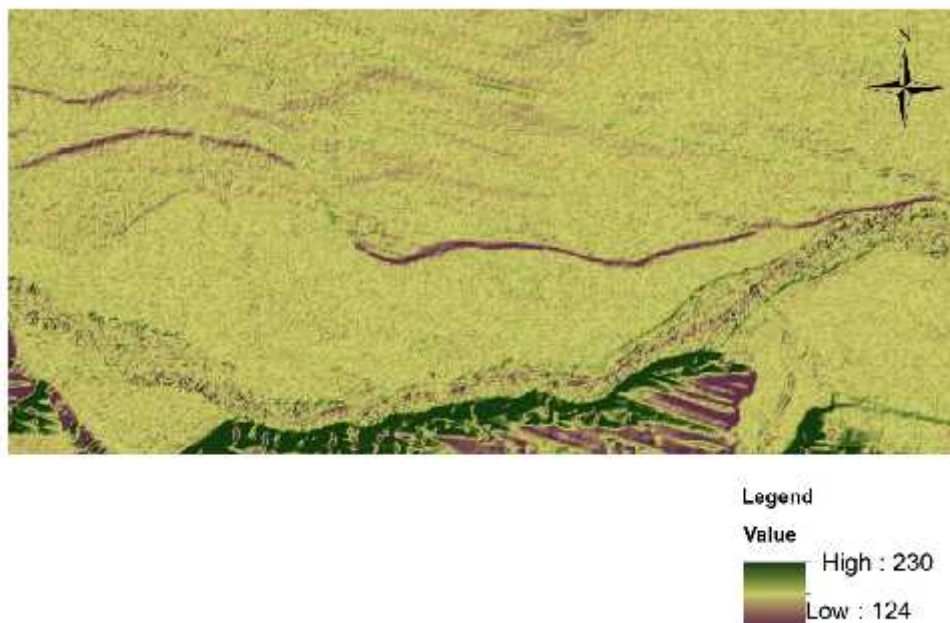
Figure 2. The hildshade map

Has been required steps to get to full steam order, this map assigns a numerical sequence segments raster representing branches of a linear network.

Another map is represent by flow direction (Figure 3). This map shows the dominant direction of flow. If a cell has the same change in z-value in multiple directions and that cell is part of a sink, the flow direction is referred to as undefined. In such cases, the value for that cell in the output flow direction raster will be the sum of those directions. When using the NORMAL option, a cell at the edge of the surface raster will flow toward the inner cell with the steepest drop in z-value. If the drop is less than or equal to zero, the cell will flow out of the surface raster.

Stream Map order had the raster data stream and flow direction raster that derived from the same area. Con function was used to create raster Stream Network.
It was created 4 classes for stream order in the study area It can be noted in the plains are order 4 and 2 stream and in the high terrace area are of order 1 and order 2. (Figure 3)
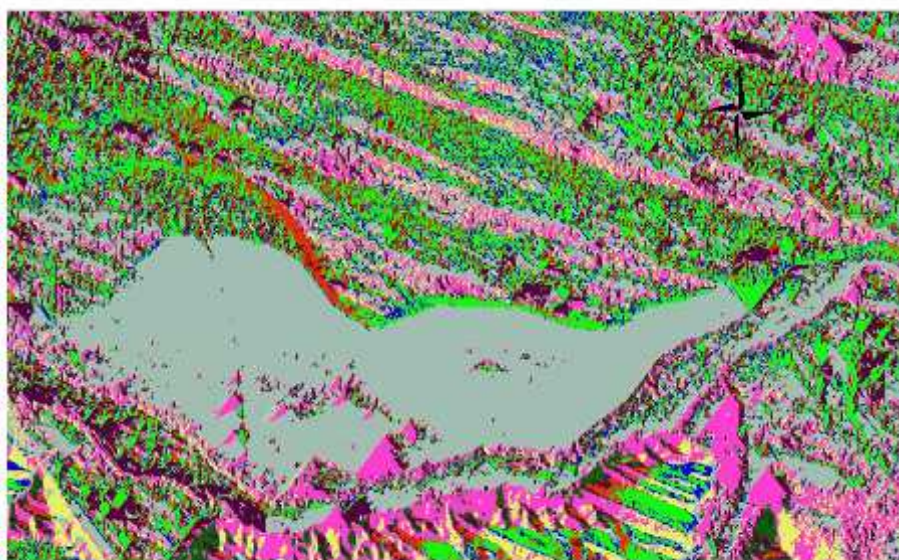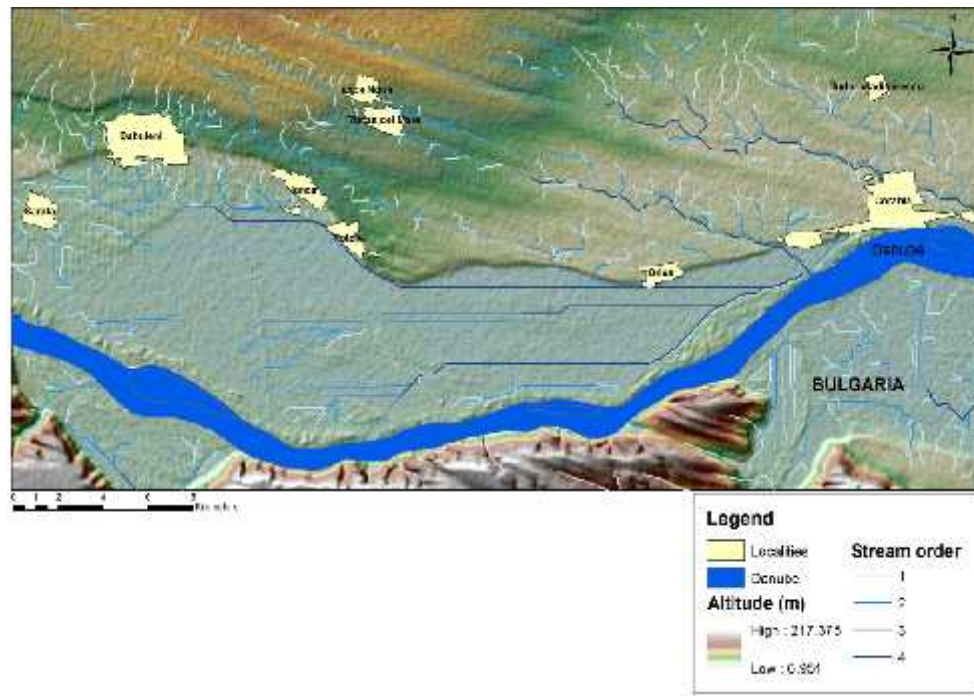

Figure 3 Flow Direction map of the study area

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Figure 3. The stream order map

CONCLUSIONS

Hydrological modeling provides an important tool to analyze phenomena related to possible risk.

The three maps of the study area provide different information.

The hildashade map understanding the targeting of slopes in the study area. Altitude values ranging from 124-230 m. The crops are influenced how are orientation slopes and elevation.

The Flow direction map presents areas of water shortage. We know that the ship is Dăbuleni – Potelu- Corabia is the most arid area in Romania.

The last map is the order stream can be seen the 4 categories of tributaries and how their spatial arrangement.

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