

# Introduction

## "IntErO" software

From the viewpoint of erosion, outflow is the most important element of the hydrological cycle and that is why it is important to determine it as accurately as possible by measuring and predicting. There are many mathematical models for calculation of the quantity of sediment. One of these is the analytical model of Prof. Gavrilovic for determining the intensity of erosion and outflow for a natural river basin.

Software package **"IntErO"** (**I**ntenzitet **E**rozije i **O**ticanje/**I**ntensity of **E**rossion and **O**utflow) incorporated and upgraded the first program generation:

- **"Slivovi/River basins"**<sup>1</sup>, calculating the sediment quantity for input data by analytical method of Prof. Gavrilovic for the soil erosion intensity, as well as the calculation for the maximum outflow, also by Gavrilovic.
- **"Površine i rastojanja/Area and distance measuring"**<sup>2</sup>, used in research of outflow and erosion intensity to get the values of area (basin area, area between isohypses, etc.) and lengths i.e. distances on the map (main watercourse length, length of the watershed, etc.)

The software was created in the program language Borland Delphi and it works with the Windows operating systems. For user interface and reports, choosing between Serbian and English language is possible.

Upon data entry, after processing the physico-geographical and hydrological inputs obtained, the results are received immediately with this program, thus avoiding frequent mistakes that occur as a consequence of manual processing of the data from the field.

Use of such a program sets up a database of harmonised \*.sli and \*.plt structures and contents for the basins under research. For that reason, it is much easier to follow the changes of the outflow and soil erosion intensity processes in basins.

In addition to the speed with which the results are obtained and the accuracy, the software in this program package reveals certain illogicalities in data entry, warns of mistakes and does not allow the calculation of results for illogical data, which is not the case with the classic calculation.

In river basin research, the programming sets the following controls, that is, identification of illogicalities in data entry:

- number of isohypses has to be one less than the number of areas between isohypses;
- the sum of coefficients  $f_p$ ,  $f_{pp}$  i  $f_o$  has to be 1, i.e. 100%;
- the sum of coefficients  $f_{\text{š}}$ ,  $f_t$  and  $f_g$ , has to be 1, i.e. 100%;
- that the connection between  $f_s$ ,  $f_t$  and  $f_g$  is established with  $x$  a
  - bare land + ploughland =  $f_g$
  - orchards and vineyards + mountainous pastures + meadows =  $f_t$
  - degraded forests + forests with good spacing =  $f_s$
- that the total basin area has to equal the sum of parameters  $F_v$  and  $F_m$ ;
- that elevation of the lowest isohypse has to be lower or equal to the lowest spot elevation in the basin;

- that the total length of the main watercourse with tributaries of the first and the second order,  $\Sigma L$ , has to be above or equal to the length of the main watercourse,  $L_v$ ;
- that the length of the main watercourse,  $L_v$ , has to be above or equal to the shortest distance between the source and the mouth.

If any of the conditions of data correctness are not met, the program reports an error and requests from the user to correct the incorrectly entered illogical input data.

In addition to the abovementioned cases, the program also checks the parameters for calculation of the coefficients  $Y$ ,  $X_a$  and  $\varphi$  and as an option it makes possible automatic rearrangement of percentages by elements to 100%.

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<sup>1</sup> Spalevic, V., Dlabac, A., Spalevic, B., Fuštic, B., Popovic, V.: Application of Computer-Graphic Methods in Studying the Discharge and Soil Erosion Intensity - I Programme "Drainage Basins". Agriculture and Forestry, 19-36, Vol. 46, 1-2, Podgorica, 2000.

<sup>2</sup> Spalevic, V., Dlabac, A., Jovovic, Z., Rakocevic J., Radunovic, M., Spalevic, B., Fuštic, B.: The "Area and distance Measuring" Program. Acta Agriculture Serbica, Vol IV, 8, 63-71, Cacak, Serbia, 1999.