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R: a statistical environment for hydrological analysis

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The free software environment for statistical computing and graphics “R” has been developed and it is maintained by statistical programmers, with the support of an increasing community of users with many different backgrounds, which allows access to both well-established and experimental techniques. Hydrological modelling practitioners spent large amount of time in pre- and post-processing data and results with traditional instruments. In this work “R” and some of its packages are presented as powerful tools to explore and extract patterns from raw information, to pre-process input data of hydrological models, and post-processing its results. In particular, examples are taken from analysing 30-years of daily data for a basin of 85000 km2, saving a large amount of time that could be better spent in doing analysis.

In doing so, vectorial and raster GIS files were imported, for carrying out spatial and geostatistical analysis. Thousands of raw text files with time series of precipitation, temperature and streamflow were summarized and organized. Gauging stations to be used in the modelling process are selected according to the amount of days with information, and missing time series data are filled in using spatial interpolation. Time series on the gauging stations are summarized through daily, monthly and annual plots. Input files in dbase format are automatically created in a batch process. Results of a hydrological model are compared with observed values through plots and numerical goodness of fit indexes. Two packages specifically developed to assists hydrologists in the previous tasks are briefly presented.

At the end, we think the "R" environment would be a valuable tool to support undergraduate and graduate education in hydrology, because it is helpful to capture the main features of large amount of data; it is a flexible and fully functional programming language, able to be interfaced to existing Fortran and C code and well suited to the ever growing demands of hydrological analysis; and finally because it is a promising environment for tackling most of the practical problems that reality poses to the hydrological modeller.