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MODERN GEOLOGICAL MAPPING: FREE SOFTWARE AND SATELLITE POSITIONING SYSTEM

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Nowadays easy accessibility to Information Technologies through Internet and the availability of satellite positioning systems discloses new perspective to geological survey and mapping procedures. The GNU project together with Linux kernel has made available a completely free operating system together with development facilities. This leads researchers to participate actively to software development, sometimes being developers themselves or by funding development of Free Software. The freedom to use, distribute, study and modify the software makes possible to use and adapt to specific geological requirements the leading generic Geographical Information System (GIS) and mapping projects as the Geographic Resources Support System (GRASS GIS) and the Generic Mapping Tools (GMT). Our contribution presents a complete workflow focused on geological mapping activity: from survey to processing/visualization to print-ready map-making. A structural geology mapping and a riverbed-alluvial plain system morpho-sedimentary mapping are presented to test the suitability of the chosen working environment. In this way we are forced to abstract specific needs from general requirements. Field survey activities have been carried out with the aid of a Global Positioning System (GPS) receiver and a Personal Digital Assistant (PDA) device put together in a free GPS/PDA software that associates geological data and observations with their respective geographical position. Also digital camera shots have been geographically registered through EXIF IFD tags, and included in the survey databases. Statistical analysis has been done directly on surveyed data inside the geographical/geological database using the R statistical analysis package, avoiding import/export procedures. Finally, print-ready maps have been produced. Correct letter signs, colours and symbols are used to produce congruous maps. LaTeX typesetting language has been used for detailed, congruous and well typeset legends. The use of Free Software gives direct control on every step of the process. In this way we have a solid base to develop features we need and, whenever more efficient new solutions are available, we are able to implement them in the working environment without needing to change the whole. This work, done with the intensive use of the Information Technologies, is firmly scientist-centered, so that software conforms to the research process and not vice-versa.