



From digital mapping to GIS-based 3D visualization of geological maps: example from the Western Alps geological units

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Collection of field geological data and sharing of geological maps are nowadays greatly enhanced by using digital tools and IT (Information Technology) applications. Portable hardware allows accurate GPS localization of data and homogeneous storing of information in field databases, whereas GIS (Geographic Information Systems) applications enable generalization of field data and realization of geological map databases. A further step in the digital processing of geological map information consists of building virtual visualization by means of GIS-based 3D viewers, that allow projection and draping of significant geological features over photo-realistic terrain models. Digital fieldwork activities carried out by the Authors in the Western Alps, together with building of geological map databases and related 3D visualizations, are an example of application of the above described digital technologies. Digital geological mapping was performed by means of a GIS mobile software loaded on a rugged handheld device, and lithological, structural and geomorphological features with their attributes were stored in different layers that form the field database. The latter was then generalized through usual map processing steps such as outcrops interpolation, characterization of geological boundaries and selection of meaningful punctual observations. This map databases was used for building virtual visualizations through a GIS-based 3D-viewer that loaded detailed DTM (resolution of 5 meters) and aerial images. 3D visualizations were focused on projection and draping of significant stratigraphic contacts (e.g. contacts that separate different Quaternary deposits) and tectonic contacts (i.e. exhumation-related contacts that dismembered original ophiolite sequences).

In our experience digital geological mapping and related databases ensured homogeneous data storing and effective sharing of information, and allowed subsequent building of 3D GIS-based visualizations. The latter gave realistic and easy-to-read representations of areas of geological interest and are a useful tool to overcome the problems that commonly occur in transferring contents of geological maps to non-expert users (e.g. in the frame of managing and disseminating geoheritage information). Although 3D GIS-based visualizations have not the capabilities of real 3D geological models (i.e. numerical models that actually allow building and checking geometry of geological units), they represent a useful for field geologists that can easily visualize their map representations and related uncertainties.