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Current trends in geomorphological mapping

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Geomorphological mapping is a world currently in motion, driven by technological advances and the availability of new high resolution data. As a consequence, classic (paper) geomorphological maps which were the standard for more than 50 years are rapidly being replaced by digital geomorphological information layers. This is witnessed by the following developments: 1. the conversion of classic paper maps into digital information layers, mainly performed in a digital mapping environment such as a Geographical Information System, 2. updating the location precision and the content of the converted maps, by adding more geomorphological details, taken from high resolution elevation data and/or high resolution image data, 3. (semi) automated extraction and classification of geomorphological features from digital elevation models, broadly separated into unsupervised and supervised classification techniques and 4. New digital visualization / cartographic techniques and reading interfaces.
Newly digital geomorphological information layers can be based on manual digitization of polygons using DEMs and/or aerial photographs, or prepared through (semi) automated extraction and delineation of geomorphological features. DEMs are often used as basis to derive Land Surface Parameter information which is used as input for (un) supervised classification techniques. Especially when using high-res data, object-based classification is used as an alternative to traditional pixel-based classifications, to cluster grid cells into homogeneous objects, which can be classified as geomorphological features. Classic map content can also be used as training material for the supervised classification of geomorphological features. In the classification process, rule-based protocols, including expert-knowledge input, are used to map specific geomorphological features or entire landscapes. Current (semi) automated classification techniques are increasingly able to extract morphometric, hydrological, and in the near future also morphogenetic information.
As a result, these new opportunities have changed the workflows for geomorphological mapmaking, and their focus have shifted from field-based techniques to using more computer-based techniques: for example, traditional pre-field air-photo based maps are now replaced by maps prepared in a digital mapping environment, and designated field visits using mobile GIS / digital mapping devices now focus on gathering location information and attribute inventories and are strongly time efficient. The resulting ‘modern geomorphological maps’ are digital collections of geomorphological information layers consisting of georeferenced vector, raster and tabular data which are stored in a digital environment such as a GIS geodatabase, and are easily visualized as e.g. ‘birds’ eye’ views, as animated 3D displays, on virtual globes, or stored as GeoPDF maps in which georeferenced attribute information can be easily exchanged over the internet.
Digital geomorphological information layers are increasingly accessed via web-based services distributed through remote servers. Information can be consulted – or even build using remote geoprocessing servers – by the end user. Therefore, it will not only be the geomorphologist anymore, but also the professional end user that dictates the applied use of digital geomorphological information layers.