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Semi-automated mapping of geomorphological process domains - towards a geomorphological map of the European Alps

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Within geomorphological process domains landscape evolution is governed by one or a collection of Earth surface processes. In manual geomorphological mapping process domains are identified by aggregation of landforms related to certain types of processes. This approach has recently been adapted for semi-automated mapping of geomorphological process domains using object based image analysis and digital terrain data. The methodology is suitable as long as data resolution allows the identification of single landforms. This is not the case for low resolution data like for example SRTM or GDEM data. However, they are available at no cost and covering nearly the whole land surface of the Earth enabling the analysis of large areas. We aim for a methodology to delineate semi-automatically geomorphological process domains without incorporating single landforms. A concept for a scientific workflow and first results are presented.
The workflow is designed to deal with large scales – with low resolution data of large extents. A digital elevation model (DEM) and its derivatives are used as basic input data. Firstly semantics for geomorphological process domains are developed and geomorphometrical characteristics are defined. Based on these definitions, object based image analysis is used to create homogenous image segments. Domain-specific landform characteristics allow image segments to be classified and combined in order to derive process domains. Some important challenges need to be considered because landforms can be the result of both recent and past processes. We assume that the used low resolution terrain data represents to a great extent the imprint of long-term process activity. The delineation of recent process domains using this kind of data will probably be limited to certain process types. In order to overcome this problem other process related information such as meteorological data or the location of recent glaciers could be incorporated in the classification. The result will be a geomorphological map of the European Alps showing the catchment-specific disposition of process domains.