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GeoGML – a Mark-up Language for 4-dimensional geomorphic objects and processes

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We developed an use-oriented GML3 based data model that enables researchers to share 4-dimensional information about landforms and their process related interaction. Using the Unified Modelling Language it is implemented as a GML3-based application schema available on the Internet.

As the science of the land's surface Geomorphology investigates landforms, their change, and the processes causing this change. The main problem of comparing research results in geomorphology is that the objects under investigation are composed of 3-dimensional geometries that change in time due to processes of material fluxes, e. g. soil erosion or mass movements. They have internal properties, e. g. soil texture or bulk density, that determine the effectiveness of these processes but are under change as well.

Worldwide geographical data can be shared over the Internet using Web Feature Services. The precondition is the development of a semantic model or ontology based on international standards like GML3 as an implementation of the ISO 109107 and others. Here we present a GML3-based Mark-up Language or application schema for geomorphic purposes that fulfils the following requirements: First, an object-oriented view of landforms with a true 3-dimensional geometric data format was established. Second, the internal structure and attributes of landforms can be stored. Third, the interaction of processes and landforms is represented. Fourth, the change of all these mentioned attributes over time was considered.

The presented application schema is available on the Internet and therefore a first step to enable researchers to share information using an OGC's Web feature service. In this vein comparing modelling results of landscape evolution with results of other scientist's observations is possible. Compared to prevalent data concepts the model presented makes it possible to store information about landforms, their geometry and the characteristics in more detail. It allows to represent the 3D-geometry, the set of material properties and the genesis of a landform by associating processes to a geoobject. Thus, time slices of a geomorphic system can be represented as well as scenarios of landscape modelling. Commercial GI-software is not adapted to the needs of the science of geomorphology. Therefore the development of an application model i. e. a formal description of semantics is imperative to partake in technologies like Web Feature Services supporting interoperable data transfer.