



## **Paleo river network reconstruction in the Alpine region**

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The Alpine topography formed through the interaction between convergent tectonic and surface processes, yet the contribution of different drivers (topography, mantle processes, and drainage basin changes) remains an ongoing controversy. Surface redistribution of mass and its first order metric, topography, is a major process affecting the tectonic evolution. Mantle processes and lithospheric structure are affected by vertical motions due to surface unloading. Drainage basin changes introduce an additional effect on the surface evolution, namely river captures and horizontal movement of water divides that indicate and drive spatial variability in erosion rates.

The influence of the topographic evolution by erosion even increases in the post-tectonic stage, in which shortening has ceased. The river profiles and drainage basins of the Alpine rivers are both the recorders of the tectonic history and active players in the erosional processes. We present a geomorphic and geographic analysis of river basins in the Alps in order to demonstrate these processes.

In order to investigate the evolution of the surface, we attempt to apply geomorphic principles on paleo river networks as an interpretation tool. We have constructed a series of paleo geographic maps using sedimentology and provenance data from the literature, as well as unpublished industry data, and correct these features for paleo location based on tectonic reconstructions. From the interpreted river network reconstruction, the predicted erosion rate variability is compared with modern erosion rates and fit to long-term exhumation rates derived from thermochronometry.

We observe disequilibria in the river networks that are related to events in regions well outside the Alpine orogen, including the Carpathians and the Rhine Graben. Geomorphic perturbations in steepness, erosion rate or network geometry have propagated upstream into the Alps. Systematic changes in the river network have continued into the post-tectonic stage of the Alps. They have induced temporal changes in exhumation rate that are non-tectonic in origin.

The reconstructed paleo topographic maps are also a starting point for other geomorphic approaches, which can further validate the maps and thus refine our knowledge of the paleo Alpine surface.