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Geomorphometric mapping of spatio-temporal changes in Plio-Quaternary uplift in the NW European Alpine foreland

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**Abstract –** A way to explore the causes of Plio-Quaternary uplift in NW Europe consists in identifying the distribution of uplifted areas and evaluating relative uplift ages. Here we use the composite metric *R* of fluvial landscapes, which involves three different hypsometric integrals (catchment, drainage network, and trunk stream), in order to get time information (Demoulin, 2011). Main controls on *R* are catchment size *A* and uplift age. To isolate the latter information, we use the derived *SR* index, which is the slope of the linear fit between *R* and ln(*A*). We calculate *R* for more than 7000 basins larger than 15 km2 and determine *SR* values for 60-km-wide regions in five N- to NW-trending zones of alternating Paleozoic massifs (Massif central-Brittany; Rhenish shield; Bohemian massif) and Meso-Cenozoic basins (Paris basin; Franconian basin) covering the whole NW European platform in front of the Alpine arc. The resulting 350- to 750-km-long *SR* profiles seem to provide the most meaningful time information, better than that obtained with noisier higher-resolution *SR* maps. Preliminary results of the study especially evidence a systematic increase in *SR* from south to north across the Paris basin and Rhenish shield zones that suggests northward propagation of an uplift wave that started from ~200 km north of the alpine collision front in Pliocene times and travelled across this part of the European platform. The Bohemian Massif and the Massif central-Brittany zone show more complex *SR* patterns that might be linked to interferences between the uplift wave and more local phenomena (related, e.g., to WNW-oriented compression in front of the Carpathian arc). Surprisingly, the Franconian basin displays fairly uniform low to moderate *SR* values suggesting that no tectonic perturbation occurred there since at least the late Early Pleistocene. In conclusion, this new geomorphometric approach of uplift chronology provides a wealth of data, whose careful analysis will help get fresh insight into the timing and the causes of Plio-Quaternary uplift in NW Europe.

Demoulin A., 2011. Basin and river profile morphometry: A new index with a high potential for relative

dating of tectonic uplift. Geomorphology 126, 97-107.