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Quaternary river incision *versus* denudation in the uplifted Ardenne (W Europe)

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River incision is often used to derive information about tectonic uplift although this is relevant only if the effect of other factors, like the position within the hydrographic network, can be estimated and removed. Instead, calculating the spatially variable incision amount provides denudation data which may interestingly be compared with other denudation estimates. Taking the uplifted Ardenne massif (western Europe) as an example, we use a dataset of 71 values of incision since the abandonment of an extended terrace level dated ~0.8 Ma (plus 28 secondary data) to derive a basin-scale functional relationship linking incision with distances to the regional base level (L_c) and to the source (L_s), these two variables describing completely the position within the hydrographic network. Our final best fit (R = 0.91) is expressed as $I = I_0 * (1 - a * L_c^b / L_s^c)$, I_0 being the incision measured at the basin outlet. The modeled incision decreases only slowly in the upstream direction, the exponential reduction to zero incision occurring for $0 < L_s < 5$ km. Moreover, the effectiveness of the incision wave propagation toward the headwaters varies with the position in the network. From the calculated volume of rock eroded by fluvial incision, referred to the entire basin area, we derive an equivalent denudation rate of 5 mm/ky that we compare with denudation rates provided by cosmogenic nuclide studies in order to discuss the cause (tectonic or climatic?) of the increase in denudation rate observed in the Ardenne around 0.7 Ma. The comparison indicates that only ~12 % of the total denudation since 0.8 Ma resulted from tectonically forced river incision, the remainder corresponding to a climatically-driven increase in hillslope erosion in areas with outcropping weak rocks located in the hardly uplifted margins of the Ardenne massif. Therefore, the acceleration of denudation at 0.7 Ma appears to be primarily a response to the climatic

degradation marked by the onset of increased amplitude of the 100-ky glacial cycles at that time.