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Analysis of lateral mobility of Ardenne rivers during the last centuries using iron slag

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In the Ardenne region, old maps of different periods indicate that the layout of major rivers has been relatively stable since the end of the 18th century. However, given the scale of the different documents and the relative inaccuracy of their georeferencing, it is not possible to precisely measure the rivers' lateral erosion or to study the dynamic of small rivers. Moreover, maps older than the 18th century are not precise enough to permit this type of approach.

Quantities of slag elements are present in the Ardenne rivers. These waste products come from hundreds of ironworks (blast furnaces and bloomeries) built close to different-sized rivers between the 14th and the 19th centuries. Slag was piled onto the floodplains and frequently thrown out directly into the rivers. For centuries, these slag elements were carried away during floods and were spread out along rivers.

Given their properties, slag elements can be easily identified in sediments. When the slag elements are present in fine sediments at the point of contact with the gravel sheet, it means that the river has moved laterally since the inception of the iron industry, swept away older sediments and deposited more recent sediments contaminated by the slag. From historical studies, we precisely dated the periods of ironwork activity in several valleys. We also analysed the vertical concentrations of slag elements in several borings carried out along perpendicular cross sections. These data allowed us to estimate the lateral erosion velocity of some channels over several centuries. Moreover, we reconstructed the topography of several alluvial plains at the time ironworks were established and we evaluated sedimentation rates.