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Impacts of climatic changes on fluvial sediment fluxes in north western Europe: The Middle and Late Pleistocene Meuse river system

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Climate change and tectonics can generate signals in a source-to-sink system in the form of changing sediment supply. The study of the propagation of this signal through the system might elucidate how different source-to-sink systems respond to a given perturbation, for instance, the Early to Middle-Pleistocene climate transition. Knowledge on the temporal and spatial responses to such perturbations in a catchment is still limited. Previous studies, with the support of landscape evolution models, demonstrate that several thousands of years might be needed for an extreme-climate-transition-induced signal to propagate through a river catchment (an example of source-to-sink system). The present work aims to contribute to the understanding of how such systems might react when submitted to rapid climate change events by studying the Meuse river catchment. The primary goals are to characterize and quantify the main controls on sediment flux of this fluvial system as a response to the Early to Middle Pleistocene climate transition as well as to assess how climate signals propagated through this source-to-sink system during the last four glacial-interglacial cycles, starting around 450.000 years ago.

To achieve our goals, three main tasks are proposed. In the first stage of this project, with the support of high-resolution DEM and high-resolution sedimentary cores, the different Meuse fluvial terrace maps are updated. For that, a new cross-border fluvial terrace map between the Netherlands, Belgium and Germany is produced. Characterization and mapping of sediment grain-size and provenance is also carried out. The new Meuse terrace map will guide the sampling campaign of Meuse terrace sediments. The samples will be used for cosmogenic-nuclide age-dating of the sampled terraces. Two dating methods will be used depending on how deeply buried and well-preserved the terraces are: burial isochrone ($^{26}Al/^{10}Be$) where sediment cover thickness is greater than 4,5 – 5 m, and depth profile (^{10}Be) when the terrace surface is well preserved. These methods will be applied to specific terrace steps, in order to date those around the Mid-Pleistocene transition. Beryllium-10 age-dating will possibly also be applied to specific sedimentary levels (cores, outcrops), in order to infer averaged denudation rates and, consequently, the sediment fluxes, during the investigated climatic cycles. During the latter part of the project, all the data will be set in a temporal framework using the cosmogenic dating results and existing age controls.