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Unraveling the Quaternary river incision in the Moselle valley (Rhenish Massif, Germany): new insights from cosmogenic nuclide dating (10Be/26Al) of the Main Terrace complex

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Throughout the whole river network of the Rhenish Massif, the terrace complex of the so-called Main Terrace forms the morphological transition between a wide upper palaeovalley (plateau valley) and a deeply incised lower valley. The youngest level of this Main Terrace complex (YMT), directly located at the edge of the incised valley, represents a dominant geomorphic feature in the terrace flight; it is often used as a reference level to identify the start of the main middle Pleistocene incision episode (Demoulin & Hallot, 2009). The latter probably reflects the major tectonic pulse that affected the whole Massif and was related to an acceleration of the uplift rates (Demoulin & Hallot, 2009). The Main terraces are particularly well preserved in the lower Moselle valley and are characterized by a constant absolute elevation of their base along a 150 km-long reach. Despite that various hypotheses have been proposed to explain this horizontality (updoming, faulting...), all studies assumed an age of ca. 800 ka for the YMT, mainly based on the questionable extrapolation of palaeomagnetic data obtained in the Rhine valley. Therefore, a reliable chronological framework is still required to unravel the spatio-temporal characteristics of the Pleistocene evolution of the Moselle valley.
In this study, we apply cosmogenic nuclide dating (10Be/26Al) to fluvial sediments pertaining to the Main Terrace complex or to the upper Middle Terraces. Several sites along the lower Moselle were sampled following two distinct sampling strategies: (i) depth profiles where the original terrace (palaeo-)surface is well preserved and did not experience much postdepositional burial (e.g., loess cover); and (ii) the isochron technique where the sediment thickness exceeds 3 m. Cosmogenic nuclide ages recently obtained for three rivers in the Meuse catchment in the western Rhenish Massif demonstrated that the Main Terraces were younger than expected and their abandonment was diachronic along the hydrographic network (Rixhon et al., 2011). These results are consistent with the reconstruction proposed for the Middle and Lower Terraces of the Moselle (Cordier, 2006). Here, we present preliminary results of this ongoing study, aiming at discussing their significance to improve the knowledge of the river incision mechanisms in response to combined tectonic and climatic signals.

References

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