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Investigating historical floodplain dynamics using portable luminescence profiling in a Rhine sub-tributary (Lower Bruche, E. France)

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In parallel to standard optically stimulated luminescence (OSL) dating, portable OSL readers have been increasingly employed in a wide range of geomorphological settings over the last decade. In fluvial landscapes, most of the OSL signal intensities measured by the portable reader were successfully used either to explore bleaching characteristics of river deposits or to rapidly gain new insights into alluvial stratigraphy via luminescence profiling (Munyikwa et al., 2020). However, going beyond the mere one- (or sometimes two-) dimensional sedimentary screening, the use of portable readers shall steer toward the production of three-dimensional chronostratigraphical information. Against this background, the high lateral mobility of the lowermost Bruche reach (directly upstream of Strasbourg), documented at the decadal scale by Jautzy et al. (2022), thus represents a suitable setting to explore the potential of field-based portable luminescence profiling to provide new insights into both lateral and vertical fluvial dynamics.

Here, the sampling approach with the portable reader using both blue and infra-red stimulations (BSL and IRSL) is twofold:

- testing the ability of the reader to measure signals of varying intensities in morpho-sedimentary units of different ages, i.e. an early Holocene terrace, historical palaeomeanders and a modern swale-and-ridge system;
- investigating the gradual lateral shifting and incision of a single palaeomeander in the floodplain recorded by a succession of palaeochannels and former point bar deposits.

Preliminary results (i) show that the older the landform, the higher the BSL/IRSL signal intensity, and highlight (ii) a consistent pattern of downward increasing BSL/IRSL signal intensities in the homogeneous fine-grained upper part of all profiles. However, BSL/IRSL signal intensities measured in the sandy fraction (i.e. lower parts of the alluvial sequences or in the swale-and-ridge system) usually record a larger scatter that requires further investigations. This study underlines the potential of the portable reader as a rapid and efficient tool for tracing historical overbank deposition in floodplains; these results will be complemented soon by standard luminescence

dating to constrain sedimentation rates.

References:

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