



Towards quantifying accumulation and reworking rates of plaggic anthrosols – new insights from single-grain feldspar luminescence

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Plaggic anthrosols are the soils resulting from plaggen agriculture. This land-use system involved fertilising of formerly poor soils by sods enriched with animal manure (the so called plaggen) as well as a systematic elevation of the arable fields and thus a modification of the landscape morphology. This land-use system, however, also had detrimental effects as harvesting the sods in combination with intense grazing by sheep may have promoted driftsand (re)activation and thus large scale land degradation. Plaggen agriculture was for centuries the dominant land-use type of the north-western part of the European sand belt including the Netherlands, Belgium, N Germany and parts of Denmark. Yet, rates of plaggen accumulation are poorly constrained.

In this study we propose the use of a luminescence based method to quantify accumulation rates of plaggic anthrosols. We apply a newly developed feldspar single grain luminescence protocol (Reimann et al., 2017) to ten samples from plaggen soil profile from Twente (E Netherlands). Next to the timing of deposition and active soil reworking which can be converted into rates of plaggen accumulation this protocol provides us with information on the soil mixing intensity and eventually the rate of effective soil reworking. Our results indicate that the plaggen land-use for this location started in the early Middle Ages and was abandoned in the late 19th century. The data furthermore suggests that plaggen accumulation was relatively constant during that time. However, the soil reworking rates corresponding to anthropogenic plaggen land-use reveal a different pattern and are an order of magnitude larger than the rates of natural soil reworking which are predominantly controlled by bioturbation.