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Sand and soil dynamics studied by quartz OSL dating

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Landscape evolution is the result of altering periods with active geomorphological processes and relatively stable periods with soil development. Soils and buried soils in polycyclic profiles are important indicators of landscape stability. Buried soils as micropodzols in polycyclic driftsand sequences are a common phenomena in driftsand landscapes. Insight in the age of the buried soils is of paramount importance to determine whether they indicate local or regional phases of landscape stability. However, accurate datingof palaeosols is often problematic.

Here we investigate the use of optically stimulated luminescence (OSL) dating for determining the time, available for soil formation and duration of palaeosol formation. We studied young drift-sand deposits in the Weerterbergen area in SE-Netherlands. Samples were taken from six shallow pits (<1 m deep), where aeolian sand was samples both below and above a palaeosol. For comparison, the humic fraction of the palaeosols was dated with radiocarbon methods.

OSL properties of the sand-sized quartz grains were suitable for luminescence dating. Internal consistency of results indicated that the wind-blown material was exposed sufficiently to daylight to entirely reset the OSL signal in all grains prior to deposition and burial. Results were in correct stratigraphic order, and showed that the sand deposits, and the sandwiched palaeosols, were formed during the past 200 years. The palaeosols were dated to different periods, and OSL ages suggested that the duration of soil formation was very short (< 10 years) in some cases.

For all six sites, OSL ages were much younger than the radiocarbon ages on the humic soil fraction. The latter ranged from 100 to 1500 years. Further micro-morphological investigation of the palaeosols indicated the abundance of wind-blown organic material in the soils, partly originating from bronze-age hearths in the area. Combining this information with the OSL ages made clear that some of the ‘palaeosols’ consisted of wind-blown material only and did not reflect a landscape stability phase.