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Drivers of drift sand dynamics; a reconstruction for the Wekeromse Zand, the Netherlands

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Inland active drift sand landscapes are regarded as unique ecosystems of great historical and geomorphological value. Recent studies have highlighted the role of multiple factors in the initiation and stabilization of drift sand landscapes. To unravel the importance of different forcings (e.g. agricultural practices, climate) and their interplay, insight in the chronology of drift sand dynamics is essential.
In this study, we aimed to reconstruct the dynamics of the drift sand landscape of the Wekeromse Zand (central Netherlands) and to develop a conceptual model to understand the processes involved. The Wekeromse Zand study area (370 ha) is located on the border of a central push moraine and is characterised by open active drift sands (14 ha) and vegetated hills and valleys. The surroundings are dominated by modern agricultural practices, and remnants from ancient iron age Celtic Field systems showing that the area has been in agricultural use since at least the Iron Age.
For the study area we: i) analysed historical maps going back to the early 19th century, ii) performed a field survey to map the palaeolandscape (before drift sand activation) and iii) employed optically stimulated luminescence (OSL) dating of drift sand deposits on 11 samples from two locations to determine the timing of drift sand deposition. Analysis of the available topographic maps showed no substantial aeolean activity of the area outside its morphological boundaries. OSL dating revealed that two drift sand layers were deposited between 1373 and 1462 AD and between 1680 and 1780 AD. A layer with a higher organic matter content was found at one of the sites. This suggests that the Wekeromse Zand has known three relatively stable periods: i) a period between the start of the Holocene to the Late Medieval Period, ii) in between the Medieval climatic optimum and the climatic Maunder minimum, and iii) current situation.
Despite the fact that agricultural activities occurred in this area from the Iron Age onwards, drift sand activity only started in the mid- to late 14th century. The two active phases appear to correspond with active phases in the coastal dune systems and are probably the combined result of anthropogenic land use and climatic changes.