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Controls on late Holocene drift-sand dynamics: the role of people and climate on inland aeolian activity in the Netherlands

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Holocene drift-sand activity is commonly linked directly to either population pressure (via agricultural activity) or to climate change (e.g. storminess). In the Pleistocene sand areas of the Netherlands small-scale Holocene aeolian activity occurred since the Neolithic, whereas large scale drift-sand activity started during the Middle Ages (especially after AD 1000. This last phase coincides with the intensification of farming and demographic pressure, but is also commonly associated with a colder climate and enhanced storminess. This raises the question to what extent drift-sand activity can be attributed to human activities or to natural forcing factors. In this study we compare the spatial and chronological patterns of drift-sand occurrence for four characteristic Pleistocene sand regions in the Netherlands. For this, we compiled a new supra-regional overview of dates related to drift-sand activity (14C, OSL, archaeological and historical), that we compared with existing national soil maps, historical-route networks, and vegetation and climate reconstructions. Results show a steady occurrence of aeolian activity between 1000 BC and AD 1000, interrupted by remarkable dip in aeolian activity around 2000 BP, probably caused by changing land-use practices or by lower storminess. It is evident that human pressure on the landscape was most influential on initiating sand drifting: this is supported by more frequent occurrence close to routes and the uninterrupted increase in drift-sand activity after ca AD 1000 during periods of high population density and large-scale deforestation. Once triggered by human activities, the drift-sand development was probably further enhanced several centuries later during the cold and more stormy Little Ice Age (AD 1570-1900).