Late Holocene drift-sand dynamics in the Netherlands: the role of people and climate

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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.

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 (^{14}C, 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).

Research question

Is drift-sand activity driven by human actvities or by climate?

Method

Collect all drift-sand related dates in the Netherlands
Temporal patterns: match with population density and climate
Spatial patters: compare location of drift-sand activity to locations of human pressure

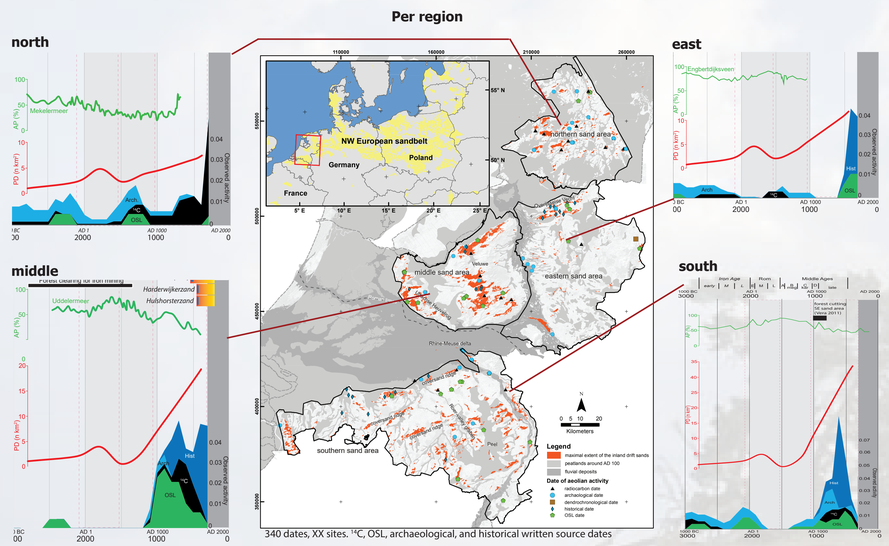
For the Netherlands from 1000 BC to ca. AD 1700

- Population density: based on historical records and archaeological settlments
- Vegetation openness: based on 4 representative pollen diagrams
- Locations of human pressure: reconstrcted route networks based on settlements

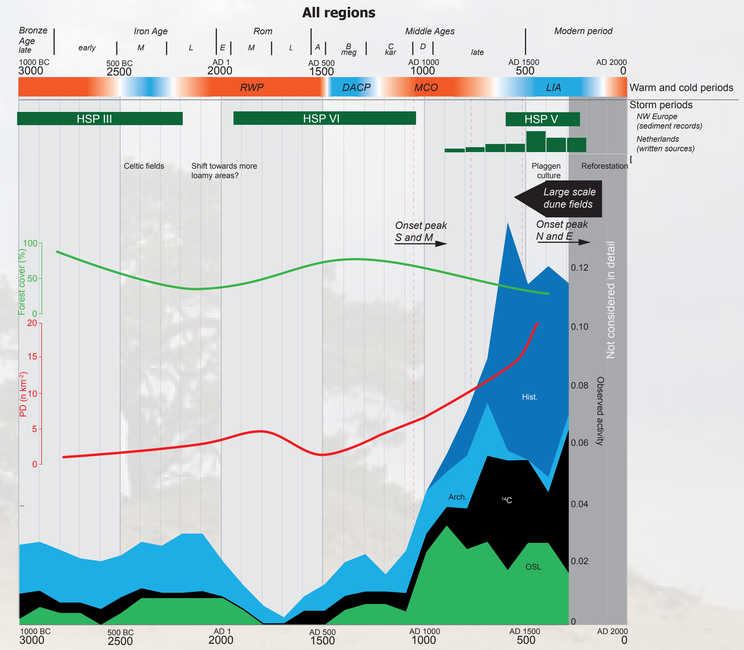
Conclusions

- Drift-sand dynamics strongly linked to human pressure in the landscape:
  - More often cloase to roads
  - More occurrence when population density is high
- Climate can accelarate the process but is not the direct cause
- Type of land use determines if sand drifting takes places when other boundary conditions are met.

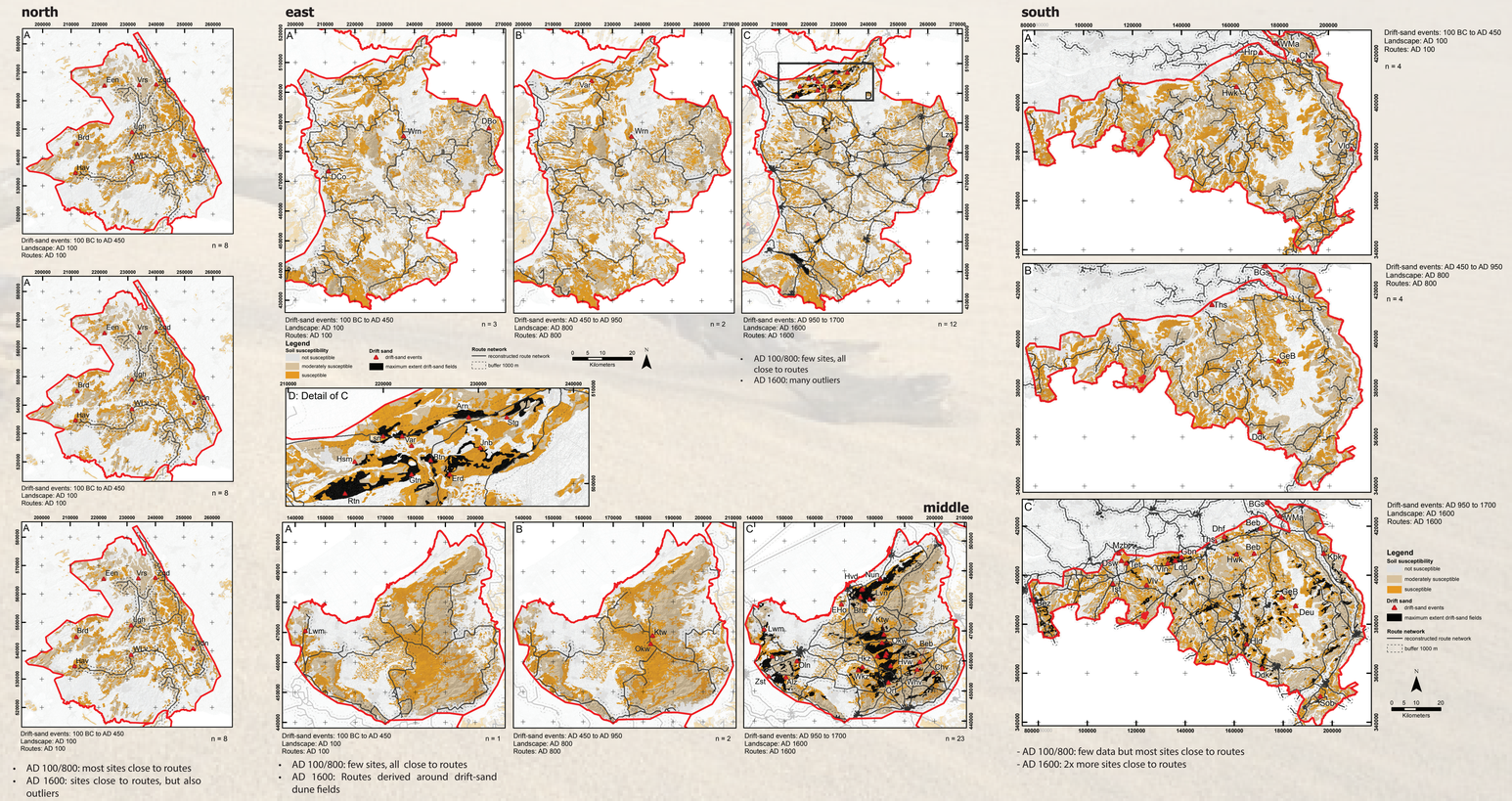
Temporal patterns



- Consistent Roman dip in drift-sand activity
- Onset of large scale activity related to population density



Spatial patterns



- AD 100/800: most sites close to routes
- AD 1600: sites close to routes, but also outliers

- AD 100/800: few sites, all close to routes
- AD 1600: Routes derived around drift-sand dune fields

- AD 100/800: few data but most sites close to routes
- AD 1600: 2x more sites close to routes

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