Geophysical Research Abstracts
Vol. 14, EGU2012-7840-1, 2012
EGU General Assembly 2012

Chronology of landscape evolution during the last centuries in the Campine area, Northern Belgium: integrating geomorphological, palaeobotanical, historical and pollution archives

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The reconstruction of past landscapes yields valuable information on the future evolution of the earth surface environment. Such reconstructions heavily rely on age control in order to link processes with specific landscape changes. The aim of this study is to integrate various archives that contain crucial elements to understand the evolution of the landscape in the Campine area during the last several 100 years. To this end, various profiles are investigated that contain multiple lines of evidence from geomorphological, palaeobotanical, historical and elemental archives. The profiles were cut in historical drift sands overlying (truncated) podzol soils that developed in Weichselian cover sands. The dune forming drift sands are the main landscape forming element on the studied interfluve in the river Nete catchment (Northern Belgium), and are thought to have been the result of deforestation while pine reforestation is held responsible for dune stabilisation.

Methods used are geomorphological techniques including profile description and optically stimulated luminescence (OSL) dating, together with other techniques including palynology, analysis of historical maps and stable lead analysis.

OSL ages of samples taken from the drift sands indicate that aeolian processes were active already before $\sim$ 500 yrs BP until $\sim$ 250 yrs BP. Temporary landscape stabilisation phases are clearly documented within the drift sands and are estimated to not last longer than several decades. Pollen analyses suggest that drift sand deposition was ongoing $\sim$ 500 yrs BP ago in a deforested landscape with dominant heather vegetation and came to an end before pine reforestation of the site. Historical maps and archives pinpoint the reforestation age of the site around $\sim$ 150 yrs BP while isolated patches of forest already existed from $\sim$ 250 yrs BP onwards. Stable lead, known to have been a major pollutant since $\sim$ 150 yrs BP in NW Europe and certainly since $\sim$ 100 yrs BP at the site, shows elevated concentrations in the very few upper cm of the drift sands.

The obtained data clearly show that the investigated archives converge to a single solution, except for the end of the drift sand phase. In contrast to what is commonly assumed, the studied archives suggest that the major sand drifting phase ended before large scale reforestation of the area. Possibly climatic and/or land-use changes other than reforestation are responsible for the final stabilisation of the landscape in this particular area of the Campine region.