Geophysical Research Abstracts
Vol. 13, EGU2011-3492, 2011
EGU General Assembly 2011

Carbon cycling in polycyclic driftsand sequences

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Polycyclic driftsand sequences are a common soil type in The Netherlands related to several cycles in cultural landscape evolution. Each cycle consists of an instable period with sand drifting, followed by a stable period with soil formation (initial podzols). These polycyclic sequences are valuable geoecological records; they contain important soil archives used for landscape evolution studies and for reconstructing past shifts in vegetation cover. Proxies commonly used for this purpose are fossil pollen analysis and 14C dating. We recently combined the mentioned proxies with OSL dating and biomarker analysis using the recently developed VERHIB model. We found the combination of proxies to offer great opportunities to gain information about carbon cycling in driftsand deposits. OSL dating provides the age of the initial deposition of the driftsand. Therefore, the observed difference with the 14C derived age of various organic matter fractions at the same depth in a profile provides initial clues about soil organic carbon input and turnover [1]. We found that such information can be expanded through biomarker analysis using the VERHIB model. We recently developed the VERHIB model to unravel preserved biomarker patterns (n-alkanes, n-alcohols and n-fatty acids) in soils or sediments into their plant species-specific origin [2]. The leaves and roots of plant species have distinctly different biomarker patterns that are both considered by the model; it uses the root to leaf input ratio as well as rooting depth as explicit parameters [2]. We found that when VERHIB modeling results are related to the fossil pollen based vegetation reconstruction from the same driftsand sequence, information can be obtained about the relative input of (young) root material vs. (old) leaf material. In addition to discussing the results of the multi-proxy application in a driftsand deposit from the southern Netherlands, we will explore its possible application in other soil types.

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