"Pedogenesis of Belgian loess-derived soils. Meteoric 10Be inventories derived from authigenic 10Be/9Be ratios. "

Vanacker, Veerle ; Campforts, Benjamin ; Govers ;
Smolders, Eric ; Baeken, Stijn ; Christl, Marcus

Document type : *Contribution à ouvrage collectif (Book Chapter)*

PEDOGENESIS OF BELGIAN LOESS-DERIVED SOILS

Meteoric ^{10}Be inventories derived from authigenic ^{10}Be/^{9}Be ratios

V. Vanacker[1], B. Campforts[2], G. Govers[2], E. Smolders[2], S. Baeken[2], M; Christl

Soils developed on loess deposits are widespread in Europe, and provide fertile soils for agriculture and forestry. In the Belgian loess belt, the youngest loess accumulation period lasted most likely until the Heinrich 2 event (25 - 20 ka). Soil genesis is mainly characterized by decarbonisation followed by clay migration [1].

Fig. 1: *Soil profile (90 masl) developed in loess deposits in the Bertem Forest, located about 20 km east of Brussels.*

In this study, we use meteoric ^{10}Be as a tracer of soil development. One undisturbed soil profile was analysed in the Bertem forest, at the northern edge of the Belgian loess belt. The soil profile was dug down to the calcareous loess of the C horizon (610 cm). Dry soil bulk densities ranged from 0.60 to 1.84 g cm^{-3}, with highest densities measured for the Bt argic horizon.

Eight soil samples (taken at depths of 7, 14, 27, 50, 72, 73, 115 and 550 cm) were analyzed for their authigenic ^{10}Be/^{9}Be ratio and ^{9}Be concentration. Two fully processed blanks were also measured to assess potential contamination with ^{10}Be or ^{9}Be during the preparation of the carrier-free samples.

Carrier-free ^{10}Be/^{9}Be ratios were measured using the TANDY AMS facility (600 kV) at ETH Zurich [2], and ^{9}Be concentrations were measured independently using an Agilent 7700x ICP-MS at KULeuven (Belgium). The mean deviation of the ^{9}Be concentration from certified samples was 4%, while the total error on the natural ^{10}Be/^{9}Be after background corrections ranged between 2.4 and 5.2%.

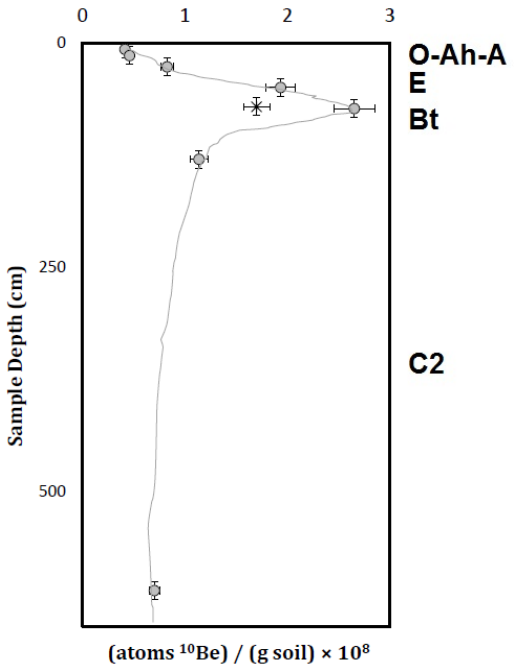

Fig. 2: *Plot of meteoric ^{10}Be concentration as a function of depth in the undisturbed soil profile.*

Our results show a systematic variation of ^{10}Be with depth. Concentrations of ^{10}Be range from 4.14×10^{7} to 2.65×10^{8} atoms ^{10}Be (g soil)$^{-1}$. The concentrations are systematically higher in the clay-enriched Bt and Btx horizons, and lower in the organo-mineral horizons.

[1] V. Brahy et al., Eur. J. Soil Sci. 51 (2000) 1
[2] M. Christl et al., Nucl. Instr. & Meth. B 294 (2013) 29

[1] *Earth & Life Institute, University of Louvain, Belgium*
[2] *Soil and Water Management, KULeuven, Belgium*