Clumped and oxygen isotope compositions of last interglacial pedogenic carbonates from Dunaszekcső, Hungary

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Pedogenic carbonates (PC) preserve information on past temperatures and δ18O of soil water from which they were precipitated [Cerling and Quade, 1993]. Studies on recent soil carbonates (SC) demonstrate that 1) they form in the summer season, 2) and thus record summer season temperatures and δ18O of precipitation [Breecker et al., 2009; Passey et al., 2010; Peters et al., 2013; Quade et al., 2013], and 3) that the δ18Osc is not affected by evaporation provided the carbonates were formed at depths >40 cm [Hough et al., 2014].

Here we studied the clumped and oxygen isotope compositions of PCs from a last interglacial paleosol in south Hungary, which was formed during MIS 5e to 5c as revealed by post-IR IRSL dating [Újvári et al., 2014]. SCs were found in 4 samples (0.00-0.15, 1.05-1.20, 1.20-1.35 and 1.35-1.50 m depths), and the δ18Osc values ranged from −7.78 to −7.19‰. Δ47-based soil temperatures (ST) calculated with the equation of Kele et al., [2015] are in a range of 19.2 to 22.5 ºC for depths >1.05 m, but the deepest (1.35-1.50 m) sample gave a temperature of 4.8 ºC. A cooler temperature (12.5 ºC) was also recorded by an SC sampled at a shallow depth (0.00-0.15 m). In general, the obtained STs are in good agreement with measured recent summer season STs for 50-100 cm depths (21.4-19.1 ºC). δ18O of the paleo-precipitation, as calculated from paired T47-sc and δ18Osc measurements range from −7.55 to −6.97‰ in broad agreement with the summer season δ18Oprec values (−6.18±0.94‰) measured at the Zagreb GNIP station between 1980-1995. Obviously, further measurements are needed to check if the lower T47-sc really record low STs or simply result from analytical issues. Nevertheless, disregarding the two lowest STs, these findings imply that PCs were also likely formed in the summer season during the last interglacial.