

¹⁴C-dating of the Dunaszekcső loess record using charcoals and small molluscs

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Last glacial loess at Dunaszekcső, Hungary was radiocarbon dated using charcoal fragments and shells of different mollusc species as target materials. This work was done in many subsequent steps and our general understanding on uncertainties associated with dating of these phases improved accordingly. First, a loess layer at a depth of 8.15-8.30 m containing abundant charcoals as dispersed fragments has been investigated. Charcoals were combusted in one step (at 1000 °C) by CuO oxidizer after acid-base-acid (ABA) wash and two fragments gave ages of 25568±105 and 26101±110 ¹⁴C yr BP. Snail shells of *Succinella oblonga* and *Vitrea crystallina* gave strongly overlapping ages with charcoals, while *Chondrula tridens* and *Clausilia* sp. shells showed age anomalies ranging from 500 to 900 ¹⁴C yr. Subsequent tests revealed that *Euconulus fulvus* and *Orcula dolium* yield statistically indistinguishable ages in comparison with *S. oblonga* from loess layers overlying the charcoal horizon, provided that enough carbon for graphite target based AMS measurements is available from the shells.

Later on, older charcoals were tested applying a two-step combustion protocol (first at 400 °C and later the rest at 800 °C separately, ABA-TSC₄₀₀ and TSC₈₀₀) to check if there was any bias in ages caused by the one-step combustion scheme (ABA-OSC₁₀₀₀). This test revealed that ~1000-2000 yr anomalies exist between ¹⁴C ages obtained using the 400 and 800 °C combustions, where the 400 °C fraction was always younger. This observation shows that even after ABA preparation there could be some younger carbon contamination still fixed on the charcoal fragments and low temperature combustion removes it. It seems likely that the high temperature (800 °C) stepped combustion fraction gives the older, real age of the fragments. One step bulk combustion ages are supposed to be close to the mean of these two step ages.

Results obtained on older charcoals necessitated a second test to be performed on charcoals collected from the above mentioned charcoal horizon (8.15-8.30 m). The analyses confirmed that the ABA-TSC₄₀₀ ages are always younger, in this case by ca. 600 yr (26726±142 and 27320±158 yr BP). Shells of *E. fulvus*, *Discus ruderatus* and *Trochulus hispidus* yielded younger, but mostly overlapping ages at 2 sigma compared to the charcoal age obtained by ABA-TSC₄₀₀, while the Clausilidae sp. shell age was somewhat older. We have observed a relatively large spread of conventional ¹⁴C ages, exceeding 1000 ¹⁴C yr, from the given loess horizon (8.15 to 8.30 m depth). It seems that ¹⁴C-chronology of this loess record has an uncertainty of ca. 800-1500 yr even if dating is done in high-resolution and on multiple shells or charcoal fragments. This is, however, still a huge step forward in achievable age model precision in comparison with luminescence-based chronologies.

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