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Compound-specific radiocarbon dating of leaf waxes in loess-paleosols

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Loess-paleosol sequences are important archives for paleoclimate reconstruction. On the one hand, dating of these archives is crucial. On the other hand, past changes in vegetation and climate are increasingly reconstructed based on epicuticular leaf waxes, such as long chain n-alkanes (e.g. Zech et al., 2013) and n-carboxylic acids, although the synsedimentary nature of these biomarkers has not yet been tested explicitly.
We applied compound-specific radiocarbon dating on long chain n-alkanes and n-carboxylic acids in the Crvenka loess-paleosol sequence, Serbia (Häggi et al., 2013). The obtained ages are in very good agreement with sedimentation ages inferred from stratigraphy and optically stimulated luminescence (OSL). Note that older ages of the even n-alkane homologues (or odd n-carboxylic acids, respectively) would indicate reworked, fossil compounds, but this was not the case for our samples. We did, however, find a possible tendency towards slightly younger ages for the shorter n-alkanes (C25, 27) and n-carboxylic acids (C24, 26). This is consistent with earlier findings (Matsumoto et al., 2007) and might document some post-depositional microbial production. Nevertheless, we can conclude that
(i) leaf waxes are valuable synsedimentary biomarkers for paleoenvironmental reconstructions,
(ii) post sedimentary contributions (by roots, for example) are negligible, and
(iii) compound-specific radiocarbon dating on leaf waxes might be a powerful tool to obtain more robust and high-resolution age control for loess-paleosol sequences.

Häggi, C. et al. (2013). Biogeosci. Discuss. 10, 16903-16922.
Matsumoto, K. et al. (2007) Geochem. J. 41, 483-492.
Zech, R. et al. (2013) Palaeo3 387, 165-175.