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Taphonomy of deciduous leaves and changes in the d13C signal after deposition in fresh water settings

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Carbon isotopic signals from fossil plant material are an important source of information for palaeoecology and palaeoclimatology. Usually, the 13C isotope is depleted in plant material, compared to the atmospheric 13C content, because 13C is discriminated against 12C during the process of photosynthesis. The degree of 13C discrimination depends on the photosynthetic pathway (C3, C4 and CAM) and is substantially affected by environmental factors (for example, water stress). Various plant material components, however, differ also with respect to their 13C content. It is generally assumed that the d13C signal found in fossil plants reflects that of the living plant to a sufficient degree. Obtaining information on possible alterations during the taphonomic process is, however, desirable. In this study, changes in d13C of deciduous leaves are monitored, from the living leaf still attached to the tree to leaves deposited in fresh water setting for one or more years, thus focusing on early stages of taphonomy. The considered taxa are species from Quercus (oak) and Fagus (beech). Deposited leaves from three fresh water environments in Southwestern Germany were studied: active stream in a forest, still water pond in a forest, and a waterlogged moor environment. Additionally to the isotope measurements, the degree of leaf tissue degradation and colonization with degrading organisms were observed with Scanning Electron Microscopy.