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Climate of the Past Discussions

Interactive comment on "How dry was the Younger Dryas? Evidence from a coupled δ^2H-δ^{18}O biomarker paleohygrometer, applied to the Lake Gemündener Maar sediments, Western Eifel, Germany" *by* Johannes Hepp et al.

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Hess and co-workers present a very interesting and novel dual compound-specific isotope approach to paleoclimate reconstructions. Through combining the hydrogen isotopic compositions of long-chain n-alkanes with the oxygen isotope composition of arabinose they were able to determine d-excess values for the YD – Holocene transition at lake Gemündener Maar and, subsequently, infer relative humidity (RH). Their reconstructed leaf water d-excess values range between -125 and -30 ‰Ġiven the novelty of the approach and the importance of the reconstructed d-excess values for

the following RH reconstruction an extensive discussion of the reliability of these values (irrespective of the analytical uncertainty) seems necessary and valuable. Is the wide range of reconstructed d-excess values for this site realistic, e.g. in view of modern leaf water d-excess? How can the large "short term" variations of d-excess be explained? How would the reconstructed d-excess values change if the biosynthetic fractionation values used would be different or impacted by vegetation change and thus lead to different sedimentary long-chain n-alkane ïĄď'D values? Larger changes of the terrestrial and lacustrine vegetation in the course of the Lateglacial – Holocene transition are well known. Species-specific effects seem likely not only between grasses and woody plants (as discussed regarding an overall signal dampening), but also between different woody plants (Hou et al., 2007). In addition, in a lacustrine environment the long-chain n-alkane composition (n-C27,n-C29) of sedimentary organic matter might be influenced by aquatic macrophytes (e.g. Aichner et al., 2010). Since the magnitude of fractionation between source water and biochemical compounds seems to be distinctively different for terrestrial and aquatic plants (Chikaraishi et al., 2004) even small amounts of macrophyte derived long-chain n-alkanes might have a considerable impact on the total sedimentary long-chain n-alkane ïĄď'D value. A sensitivity study could potentially identify the degree of uncertainty introduced by respective relevant factors. In the course of the YD- Holocene transition changes in precipitation isotopic composition have to be taken into account that will eventually translate into isotopic changes of source water (soil water, shallow groundwater) utilized by terrestrial vegetation. How would those changes impact on the reconstructed d-excess values? Direct comparison of station data with reconstructed RH seems difficult as the amplitude of station Rh data in monthly means is driven by the seasonal cycle whereas the reconstructed Rh values represent massively smoothed multiannual / multidecadal means (Fig. 5).

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