

Interactive comment on “Constraining Holocene hydrological changes in the Carpathian-Balkan region using speleothem $\delta^{18}\text{O}$ and pollen-based temperature reconstructions” by V. Drăgușin et al.

Anonymous Referee #1

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This paper is concerned with a Holocene aged speleothem from the Carpathian – Balkan region. They present oxygen isotope data (from the U-series dated) speleothem and compare to independent pollen derived temperature data. They combine the data sets to show the climate forcing of various time periods including the Middle Holocene and 2 of the known cold events at 8.2 and 3.2ka. What I liked most about this paper is how they clearly have a very sound understanding of oxygen isotope systematics. They describe the air mass to calcite formation controls (of which there are many) and by carefully combining aspects of their speleothem isotope curve are able to derive, a quite new and independent interpretation of the climate of this region. There are issues of course, which are relatively unresolvable but they have done the best with

C14

the data they have. I wondered about error, they quote it for the isotope data but don't really address it in the dating or the use of the pollen temperature reconstructions. In section 3.2 they find an offset from equilibrium fractionation of the modern calcite. This could be significant of course although I wondered if they wanted to calculate theoretical calcite from other palaeo-equations. I know for example that Kim and O'Neil returns lower oxygen isotope values than some of the older equations for example. How do the authors explain the offset? It is interesting that there are similarities with the stacked Mediterranean lacustrine oxygen isotope records, which show differential response to climate of different types of lakes. I assume the freshwater systems are most comparable to the speleothem record (being dependent on rainfall and MATT?). Would it be useful to compare on a figure? I guess the big question I have arising from this data is about the climate mechanism. They (rather elegantly) show that temperature plays a major role in the speleothem variation over several parts of the Holocene. But if this is not associated with changes in sources of major air masses, then what controls the changes in temperature through the Holocene?

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C15