Clim. Past Discuss.,
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Climate of the Past Discussions

Interactive comment on "Cryogenic cave carbonates in the Dolomites (Northern Italy): insights into Younger Dryas cooling and seasonal precipitation" *by* Gabriella Koltai et al.

Anonymous Referee #1

Received and published: 26 September 2020

This is an interesting manuscript investigating the internal climatic structure of YD, which in my opinion warrants publication, but I do think further reflection is probably in order. Since much of the paper's discussions/conclusions are drawn from the results of the thermal modeling experiments, it would be helpful if the method is presented in more details (maybe some references would also be appropriate). This could be done by adding additional text in the manuscript or supplemental material section.

The attempt to characterize the early YD climate, basically using only two (at most three) dated CCC may be a little too far reaching, especially given their associated errors. I think authors need to present more convincing evidence for their early YD

discussion since three of the scenarios (2b to 2d) are somehow marginally supported by only two CCC samples. This situation is in great contrast with the late YD, for which $\sim$7 dated samples exist. Better explaining why and how scenarios 2b to 2d are really relevant to the discussion would be helpful.

Authors are using various input parameters for their thermal modeling and end up presenting MAAT, ΔMAAT, MAET, ΔT, snow ΔT, etc., point at which tracking all these values in sections 4.4.1 to 4.4.3 is rather difficult and easy to mix up digits. Furthermore, they don't always match with what is reported in Table 2 or figures caption (e.g., scenario 2d and 2e is said to be forced with a MAAT of -1.5°C in the caption of figure 3 (line 534), but in Table 2 it appears to be -2°C; line 535 reads "... ΔT of 4.5°C" for scenario 2e, but in Table 2 the value is 4.7°C. The presentation of data in these sections needs to ve revised and made clearer. One way would be to add all values use in Table 2 so that is easier to track them. On the same vein, I see authors derived and reported in Table 2 the mean annual effective temperature, but nowhere in text these values are discussed.

I found Figure 3 to be rather difficult to understand. Some minor improvements, such as placing "early YD" in the right side of the plot and making the blue dashed line more visible, would certainly improve it. However, as expressed above, it is unclear to me which of the CCC really characterize scenarios 2b, c, and d, as I see only two ages with 400 to 600 yrs error that could be assigned to early YD.

I also have many small comments and suggestions that I think would improve the language and clarity of the manuscript.

I suggest using throughout the text, figures and captions capital letter C in Cave when is a proper name (e.g., Hölloch Cave, Milandre Cave, etc.).

Line 60: what do you mean by "certain proxy properties"?

Line 67: Authors could probably make use of the recently published study of Cheng et

al. 2020 in PNAS

Line 77: CCC are in fact speleothems not cave sediments, thus, I urge authors to consider them as such.

Line 84: maybe “CCC form in caves with perennial ice. . .” will be more clearer to readers than “CCC form within perennial cave ice . . .”

Line 105: Methods - is there any other way of presenting the information in this chapter without breaking it so heavily and have only 2-3 lines for various sub-chapters?

Line 129: Thermal modeling - additional information and references are needed in order to better understand the method (e.g., what might be the effect of taking 0.5 or 1 for dT/dz? What are the uncertainties of the results associated with this model?)

Line 131: a reference to whoever generated the heat flow model would be appropriate

Line 135 Equation 1 - if authors consider dT/dz = 0 then Q is 0 regardless of thermal conductivity, right? Do I miss something on how this equation really helps?

Line 136: thermal diffusivity (how fast heat diffuses through a material) is not the same with thermal conductivity (ability of a system to transport heat energy). Authors define thermal conductivity as “c” in Equation 1, but then set the thermal diffusivity of limestone to 1.2x1010ˆ-6. What value was actually used for Eq. 1, which once again, if dT/dz is assumed 0, Q would be 0.

Line 150 - 153: For consistency, use XX‰ or XX ‰ but not both ways.

Lines 180-223: I feel that the presentation of these scenarios could be clearer if all values are included in Table 2 or those already in this table are presented in text as well. Right now, I see, for some scenarios, different values in text, table, and/or caption of figures 3 and 4.

Lines 274-275: what do you mean by “Scenario 2e including provides . . .”

Line 301: it was not immediately clear to this reviewer how the value of 5.7°C was derived. Please add text to clarify.

Lines 346-347: my suggestion for rewording this part of the sentence: “. . . CCC in the Dolomites, which in contrast to many studies from Central European caves, formed not during . . ."

Line 358: add “for” at “advocates for a mild. . .”

Line 542 - Figure 4 - winter snow cover (ΔT = 2°C) is mentioned in this caption, but it is not in Table 2 for scenario 3a.

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