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Climate of the Past Discussions

Interactive comment on "Evidence of a prolonged drought ca. 4200 yr BP correlated with prehistoric settlement abandonment from the Gueldaman GLD1 Cave, N-Algeria" *by* J. Ruan et al.

Anonymous Referee #1

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Evidence of a prolonged drought ca. 4200 yr BP correlated with prehistoric settlement abandonment from the Gueldaman GLD1 Cave, N-Algeria

The manuscript is interesting and adds more to the understanding that major climatic events during the Holocene in larger part of the Mediterranean basin are synchronized and that there is a possible link between climatic events and human occupation. The manuscript deals with climate reconstruction based on 2 speleothems from the open Gueldaman cave, in N-Algeria ∼60 km from the Northern Mediterranean Sea, where well dated speleothems and archeological remains co-exist. The isotopic record of the speleothems was correlated to speleothems from central and eastern Mediterranean Sea. The major conclusions from the comparison of the isotopic record from N. Al-

geria with speleothems from Italy and Israel is that synchronicity with major drying at ca. 5600, ca. 5200 and ca.4200 yr BP occur across the Mediterranean basin. The archeological findings in the cave supports their conclusions. The weaker part of the manuscript is the discussion of the speleothems record. This section needs more clarification and re-organization. Hendy tests need to be shown as a figure, and need explanation if they were performed along single laminae or across lamination. A more in depth discussion is needed regarding the fact that the cave is open and how this can modify the isotopic record? The authors show the present-day values of the speleothems d18O and d13C but they don't discuss why the values fit more the speleothems value pre ∼5000ka. Is it due to climate change? Can it be associated with the opening of the cave? When was the cave opened? The isotopic events are well observed in GLD1-stm4 whereas in speleothem GLD1-stm2 the record hardly shows any significant change. It is impossible to compare the 4500 Ka event recorded in sample 4, to sample stm-2. The enrichment isotopic trend well observed from 4800-4600 yrBP in sample 4, but is hardly seen in sample 2. The authors need to explain why the isotopic profiles of two speleothems growing close to each other are so different. As is clearly seen in Fig. 4, there is NO relation between the growth rate and the isotopic profile. Sample 2 shows a striking change in the growth rate at ∼4800-4600, which is more than twice that of the time periods before and after. This major fast "growth-rate" occurs before the major increase in d18O and d13C in stm4. It does not seem to be related to changes in the isotopic composition, so maybe there is no connection with climate change? Changes in growth rate based on 1 or 2 speleothems are sometimes misleading because they can be associated with internal processes of water dripping mode. Sample 4 shows significant isotopic variations at ∼5800-5500 yr BP, ∼4600-4400 yr BP, etc. None of these events is reflected in the growth rate which is more or less constant at this period. The authors argue for a wetter period ca. 4800–4500 yr BP based on the high growth rates of stalagmite GLD1-stm2 and they say that it is not seen in the growth rate change of stalagmite GLD1-stm4 probably due to the lack of dating between 5023 and 4197 yr BP. This is a strange argument. Maybe another

dating point is required to solve this inconsistency, or maybe the age model is not absolutely correct. The authors don't give good explanation to why sample 2, though being the thicker speleothem, ceased to grow at ∼4100 yr, whereas speleothem 4 continued to grow. They try to suggest a phase of increased aridity, and this explanation fails to explain the continuous growth of speleothem 4. A possible explanation is that sample 2 ceased to grow due to local variations in the dripping position, rather than major climate change. The authors claim that the larger amplitudes of isotopic variations in stalagmite GLD1-stm4 (Fig. 4) can be explained by the likelihood of more evaporative and non-equilibrium enrichments due to lower drip rates, being indicated by its smaller diameters (Fig. 2), but in such case, shouldn't we expect a significant relation between the isotopic composition and growth rate? Despite these inconsistency between the two speleothems and lack of good explanation for the reasons, one speleothems show a good match with the timing of major drying events in central and Eastern Mediterranean speleothems.

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