

Interactive comment on “New constraints on the Eastern Mediterranean $\delta^{18}\text{O}:\delta\text{D}$ relationship” by K. A. Cox et al.

Anonymous Referee #2

Received and published: 14 March 2011

The paper “New constraints on the Eastern Mediterranean $\delta^{18}\text{O}:\delta\text{D}$ relationship” by Cox et al. describes the results and the analysis of water isotope measurements from samples in the Mediterranean and Eastern Greenland. The authors find a significantly different relationship between the two stable water isotopes compared to former measurements done in the 90s. The latter documented a $^{18}\text{O}/\text{D}$ slope in the Eastern Mediterranean significantly different from the global oceans whereas the new data here rather demonstrate agreement with the rest of the surface ocean data. The data are certainly worth to be published but to my opinion the paper needs major improvements before it can be accepted. My general critique is that potentially interesting ideas are taken up but are not really thought through or quantified which gives the impression of

C35

an unfinished study. In its present form I cannot recommend the paper for publication. Here is a number of specific points.

1) What is the objective of the study? The abstract speaks exclusively about some new isotope data, but what do we learn from these data? The criticized (or corrected) study of GAT96 makes some interesting remarks on evaporative conditions in the Mediterranean (page 6448 in GAT96). So how does that change if the here presented isotope values were more representative? Do we have (15 years after GAT96) access to oceanic humidity/temperature profiles in the region which would independently constrain these evaporative conditions? Basically I am missing objectives which are beyond pure isotope measurements. Finally a tracer serves to trace something. This should be elaborated in the paper.

2) There are hundreds of isotope and salinity data. If the focus of this paper are the evaporative conditions in the Eastern Mediterranean why then putting data from Eastern Greenland in this paper? They do not add any relevant information which is not already available in the GISS data base.

3) The GISS coupled model results are cited several times but only very few results are actually shown. I have problems the way the results are presented which is basically: “Schmidt 07 said there might be a resolution issue with the coupled model which is why the model didn’t reproduce the old GAT94 Mediterranean data. Now we have the new data and the mismatch does no longer exist”. However, we know that there are several large lakes/continental seas (Caspian sea, Baltic Sea) showing evaporative effects strong enough to deviate the $^{18}\text{O}/\text{Deuterium}$ relationship from the global ocean’s mean slope. To my knowledge the GISS has a description of such lakes and continental seas concerning both the water balance and flow and the respective water isotopes. Does the model produce a realistic $\delta^{18}\text{O}/\delta\text{D}$ slope in these large lakes and continental seas? If not, then it might be that the model simply does not produce the necessary evaporative conditions for such typical lake evaporation lines (i.e. humidity/temperature/isotope profiles in the boundary layer). If the claim is that the model

C36

does produce the correct $d^{18}O/dD$ slope (close to the global slope) in the Mediterranean and that the new data confirm this then I would like to see that the model indeed finds typical lake isotope slopes in the order of 4 in other regions. 4) GAT94 discusses the isotopic depth profile showing the interesting layering of western and eastern Mediterranean deep water. Can you confirm this vertical structure? What does the model say about this structure? 5) The authors mention interannual/interdecadal climate variability (EMT) to explain shifts in the isotope values between the 1990s and the more recent data here. This must somehow be quantified. What does the IAEA/GNIP data in the region show for that period? The IAEA has now also data from rivers (GNIR: http://www-naweb.iaea.org/napc/ih/IHS_resources_gnir.html) available. The GISS model was forced in a nudged mode over the respective time period. Does it show a relevant shift in the water isotopes as suggested? 6) Figure 4 is only discussed in the Appendix.

Interactive comment on Ocean Sci. Discuss., 8, 39, 2011.