

Interactive comment on “The mechanism of sapropel formation in the Mediterranean Sea: Insight from long duration box-model experiments” by Jan Pieter Dirksen and Paul Th. Meijer

Anonymous Referee #2

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This manuscript uses a box model to improve our understanding of Sapropel processes in the Mediterranean Sea. By the use of a box model, the authors are able to integrate it for long enough to look at transient behavior, and changes into/out of the sapropel. The authors use a simple 3 box model, forced by atmospheric and runoff changes. The authors show that they can develop a sapropel in such a simplified model. By analyzing the model space, the authors are able to provide insights on timing, intensity, interruptions and the relative role of different forcings in combination.

This is an interesting paper, generally well written and easy to follow. Thus it adds

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to our knowledge on this topic and is worth publishing. I would recommend minor revisions as there are some ways that the manuscript can be improved.

Authors – Only the institution is given. Is there no department or unit?

Introduction: Map, with circulation schematic would be useful to readers who are not familiar with the region.

Line 64: How are the later two models more advanced?

Line 71-77: The description of the box could be improved. Line 76 mentions that the Atlantic box, as well as the rivers are static boxes, yet the Atlantic box has been introduced and defined yet. Figure 1 uses subscripts in many cases, e.g. R1 while the text uses R1. Be consistent through the entire paper.

Line 78-87: Again, issues of subscripts or not. The authors mention E-P-R, but P is never defined as precipitation. And given since the box model diagram uses e (lower case), is this then a net evaporation (E-P). Basically, the whole discussion feels a little choppy without it being precisely defined. Additionally, as I was reading this paragraph, I was wondering why no equations. Now, they appear later in the manuscript, in section 2.3. But I'm not sure is the separation of the discussion and the associated equations is the best way to make things clear for the reader. The authors should at least think some more on this, and how best to clearly present their model.

Line 110-113: Found these sentences unclear. Please rewrite.

Line 126: What about outflow/runoff from the Black Sea. What is its magnitude and where is it considered in the model?

Line 167: Wouldn't a flux approach work better than simple temperature relaxation?

Line 239: Subscripts for variables

Figure 2: Listed as the second figure, but didn't find a reference to it until near the end of the paper. If so, renumber and move to where referred to.

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One Sentence paragraphs: Appears many times in the paper. They are not proper English and should not be used. In all cases, it should be easy to combine them with surrounding material.

Line 289: The authors mention that the decrease in vertical density difference causes a decrease in DWF. Yet wouldn't a decrease in the vertical stratification mean that it would be easier to produce deep water formation with the same heat flux?

Line 315: Line stretches into margin

Line 321: '. . .to the DWF one of. . .' – a word seems to be missing

Line 322: What is exactly meant by 'within error'

Line 365 (and additionally later in paper): River 1 – Out of river box 1 – i.e. the river flow into the given box, not the flow of a single river

Line 374: By normal values, do you mean present day?

Experiments: As I went through the paper, I realized the authors had lots of experiments. This is good in terms of exploring the parameter space and relevant ideas. But hard to keep track of. Please add a table of experiments, listing them, giving them all an easy to follow name, and clearly listing the parameters (so that it is easy to see what is changed in each).

Line 396: decrease

Line 450: Subscripts

Line 528: The authors say that exchange through the Bosphorus is out of the scope of paper. Sure, the model can't look at the sea-level changes that lead to that connection. But in terms of impacts, the change is more runoff, which the authors can and do look at with their model. So I don't see this distinction.

Line 529: define 'within error'

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Line 550: in the open. . .

Line 577: . . .system. Without it. . .

Line 578: sufficient sapropels - ??? – word(s) missing

Figure A1: I can barely see the difference between the black and blue lines. Use something more distinct. R1 should use a subscript too.

Table 1: In the descriptions, some fields uses capitals, others don't. Be consistent. Also, be careful with subscripts as elsewhere in the manuscript.

Figure 3, etc. Panels A, B, C, D, and E are not labelled.

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2019-128>, 2019.

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