

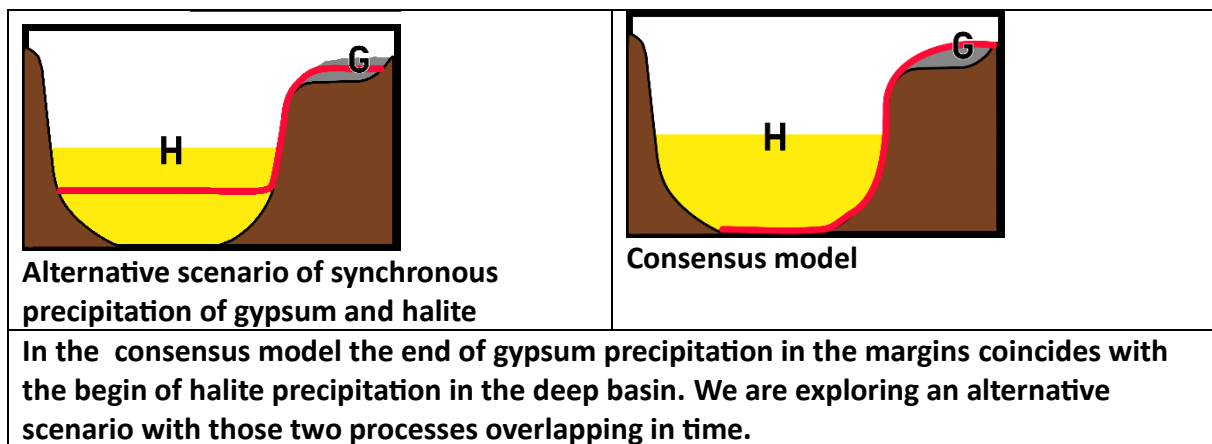
Dear reviewer 1,

we would like to thank you for your helpful and thoughtful comments. To address them properly we chose to answer them one by one.

1. A proper comparison with the real-world scenario

The aim of the authors is to test if their simplified model predicts whether the salt units (gypsum and halite) in marginal and deep basins could have been precipitated concurrently. Even though they briefly explain the existing hypotheses for the depositional patterns within the MSC, I suggest that proper definitions of marginal versus deep basins should be provided prior to elaborating their experiments, with suitable diagrams of existing models for depositional units in each setting (for example, a simplified version of Roveri et al (2014) synthesis). Such insight would make it easier for the reader to follow the author's intentions, in relation to their model experiments. I propose that the same diagram may be used to show the ambiguity in horizontal continuity of the PLG, as the authors indicate in their introduction.

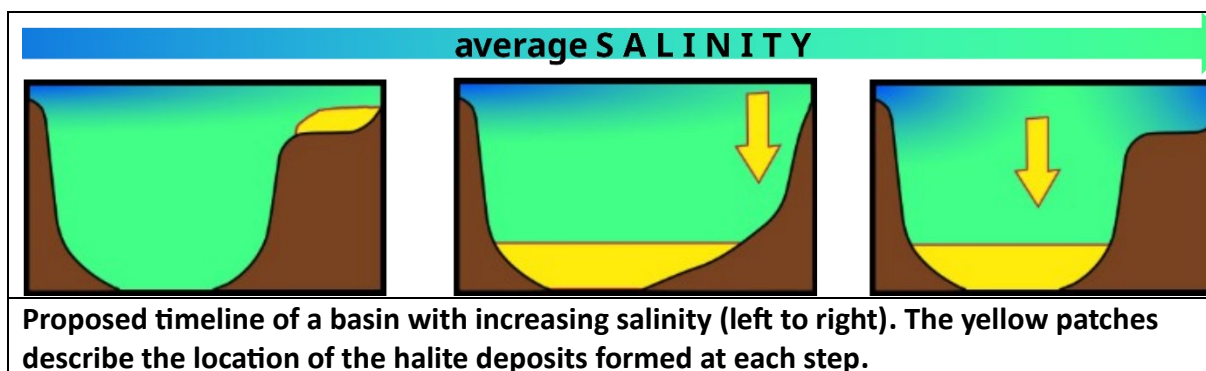
We agree that adding a figure to visualize the two different options we are exploring would be beneficial for the reader. We chose to do this in a way that relates directly to the structure of our model (first draft see below).



2. Organization

Added to my above suggestion, the manuscript may be ordered in the following sequence: A general introduction to the MSC, with explanations on marginal versus deep basins; Existing hypotheses for the different timing of sedimentary unit deposition (including diagrams); Methods; Results; Discussion – here, I suggest including a better explanation of their model results with respect to actual observations they provided in the revised introduction. Under implications, the authors combine their different configurations to develop a timeline of salinification. I suggest adding a new diagram to explain their timeline, as this is one of their final interpretations, and Conclusions.

We also prepared a figure to visualize the timeline (see below) as described in line 383 - 393. This figure in combination with the additional discussion of the time component (see question 3) will add depth to the discussion.



3. Timescales

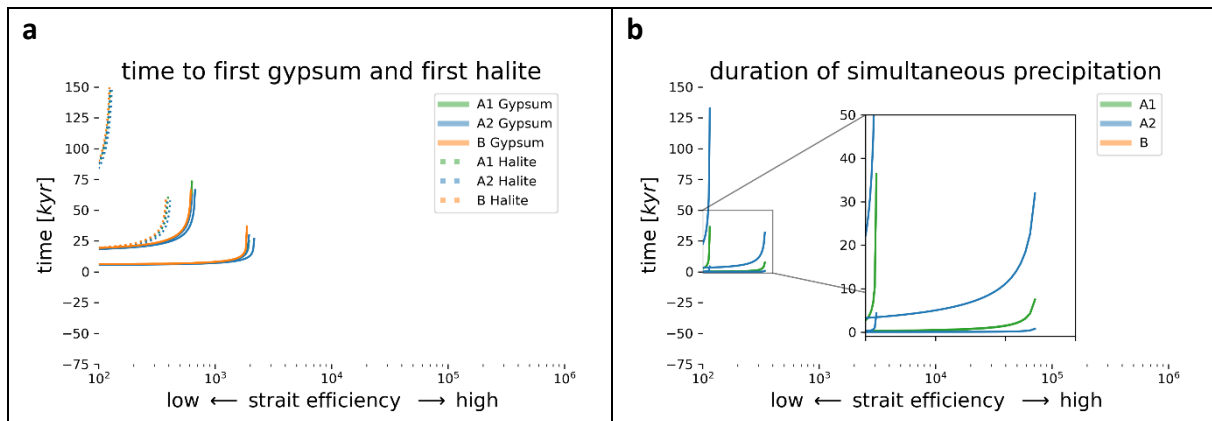
A majority of MSC researchers suggest that the PLG unit was developed as an alternating sequence of gypsum-marl couplets, with up to 17 units paced by insolation (Lugli et al., 2010, Manzi et al., 2013). For someone who may try to compare the suggested scenarios with existing timescales of PLG/ Halite unit deposition (eg: PLG stage during 5.97-5.60 Myr, Halite deposition during 5.60-5.55 Myr), no information has been provided regarding the timescales considered for model experiments. For instance, it has not been shown how long it will take to reach halite saturation in the extra box in A1 scenario. Provided that, the extra box should precipitate gypsum before reaching halite saturation. What are the periods required to reach gypsum and halite saturation points? How do they compare to the suggested insolation-paced alternations for marginal basins? How would the strait efficiency parameter impact these timescales? Unless I'm mistaken, such information does not exist in the present manuscript. Because the authors are aiming to relate their experiments with existing hypotheses, I suggest that these comparisons would be important. Is it possible to add a brief explanation of these to the manuscript?

We agree that including timescales in the manuscript would strengthen the manuscript. To achieve this, we added different time markers to the model output. Based on those results we can now analyze the timespans and durations for the different configurations and settings (see figure below, description not final)

To be able to interpret these figures correctly it is, however, important to highlight that the results describe a change that would result from a sudden change in restriction. A gradual change in restriction would lead to a different outcome. The influence of insolation is not included as time-varying forcing, instead we do explore the influence of a broad range of net-evaporation values on the steady state solution. It is, however, possible to infer their influence from previous studies that explored this effect (e.g. Ebner et al. 2024).

To elaborate on the question regarding the influence of strait efficiency we prepared preliminary versions of figures that could be included in the manuscript. They show the nonlinear behavior that is also expressed in the salinity plots (figure 2 in manuscript). Figure a describes the time the model takes to reach gypsum (solid line) or halite

concentration (dashed line). The vertical asymptote of each curve intersects the x axis at the restriction parameter that would just not yet lead to gypsum or halite. Figure b shows the timespan during which a model run would meet the conditions as defined in the manuscript. Here, the vertical asymptote of each curve marks those runs that meet the conditions once they have reached stability. i.e. the duration goes to infinity. To the left of this singularity, the model meets the conditions only for a short amount of time during the stabilizing phase.



4. Technical corrections

We are focusing on comments that would benefit from a more elaborate answer

Technical corrections and minor comments: Title- A question of time and space: A model approach to the synchronicity of gypsum and halite deposition during the Messinian Salinity Crisis. Suggestion to add 'deposition' to the title.

We have decided to change the title to

Title- A question of time and space: A model approach to the synchronous precipitation of gypsum and halite deposits during the Messinian Salinity Crisis

7 – define Ma

When using it for the first time, we will define Ma as Million years before present.

Line 11 – ...for different configurations... of what?

We plan to change the term configuration in the abstract through 'different precipitation patterns' and introduce the term in the introduction. This should prevent confusion and make the abstract easier to understand.

Line 20 – define kyr

We will use the non-shortened version of the duration and then translate to kyr when using it the first time.

Figure 1 – Add labels of different parameters (eg: evaporation, convection, diffusion) to one of the configurations. Strait of Gibraltar is not properly visible as you have not shown the Atlantic side.

We had decided against adding labels to the components to avoid cluttering of the figure. We will however add explanations of the symbols in the figure caption as well as elaborate on the meaning of the driver flux.

To make the location of the connection to the Atlantic clearer we can add an A for Atlantic and explain its meaning in the text. We want to avoid labeling the connection with ‘strait of Gibraltar’ as it is not clear where the connection to the Atlantic was located.

Model symbols and parameters – If the relative size of the extra box is f , shouldn't A_{open} be $(1-f)A_{tot}$ and A_{extra} be $(f)A_{tot}$?

Yes! We will correct that.

For V_{extra} , you have not prescribed what 500 m is (which, I assume is the depth/ thickness of the water column)

We will state in the text that our upper layer is 500m thick.

Line 135 – To arrange the diffusivity term in order → suggestion to rearrange the equation to $\rho_{mix} = K_{mix} \cdot (S_{open} - S_{deep}) \cdot A_{open} \cdot d_{mix}$.

This is a good idea that will increase the readability of the equations.

Line 140 – Shouldn't the salt flux be upward, therefore for equations 5a and 5c the j_{mix} terms become opposite in sign (positive for 5a and negative for 5c)?

This is indeed a translation error between the code and the manuscript. It is a sign error that will be corrected in the next version.

Lines 156 – should you mention the Black Sea as well?

We chose not to name the Black Sea here, since it is not clear whether the connection between those two was already established.

Figure 3c – Suggestion to update the label ca to ca_2 (correct?)

The naming in this figure is indeed unfortunate. In this case we mean ca . as in circa. We will relabel this figure to make this more obvious.

Line 271 – can you state the salinity difference?

The maximum salinity difference varies greatly depending on the parameter values, as such we cannot give an absolute value, but we can give a range and elaborate on that.

Line 274 – You have not stated to which figure you are referring to.

We will refer again to figure 3b.

Line 362 – Should 'Sea' be removed?

Yes.

Line 383 – suggestion to add a figure explaining you time series of salinification.

We liked this idea a lot. See our answer to your question 2.