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The Cryosphere Discussions

Interactive comment on "The Current State and 125 Kyr History of Permafrost in the Kara Sea Shelf: Modeling Constraints" *by* Anatoliy Gavrilov et al.

Anonymous Referee #2

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It is a very interesting and timely publication, considering various efforts to develop a circumpolar map of the subsea permafrost in the Arctic.

One of the main accomplishments of this manuscript is development of the up-to-date paleo-geographic scenario for the air temperature, sea level change, assumptions about the glaciation, etc. At the same time, it is hard to duplicate the employed paleo-geographic scenario. Here are my suggestions: 1. Plot the air temperature (ground surface temperature) for different regions for the last 125k years. As I understand there is a temperature zonation factor involved. What is it? How does the air temperature differ between various regions, subzones? 2. It is stated that "about 50-75ky bp the seal

level was the same as present". Unfortunately, the paper lacks the sea level dynamics, I think it was used in the scenario building, but not explicitly shown. Please supplement Figure 4 with a plot of the relative sea level curve with respect to the present-day conditions for the last 125k years. 3. Make a series of maps to show which areas were flooded, glaciated or exposed to air 10, 20, 40, 55, 70, 80 ky bp. It will help a reader. It is okay to take different times, e.g. middle of the MIS periods. The goal is to help future researchers to understand when a certain part of the shelf was exposed to the air. Right now, it is not clear. Also, change the y-labels in Figure 4 to "Sea level with respect to the present-day datum, m". Make values in Figure 4a negative. 4. How are the effects of salts taken into the account? Does the salt lower the freezing point depression? Do you take into the account unfrozen liquid pore water while freezing the saline water? How are the salt effects parameterized in the model? Explain and clarify in the paper. 5. The paper goes into the discussion of various ground layers (sand, clay, etc) and heat flux values. I suggest moving this analysis into a separate section, e.g. "Sensitivity analysis". Do you do sensitivity analysis with respect to salt concentration? 6. The manuscript is understandable, but terminology is used unconventionally.

Thank you and good luck.

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