The paper under review is very novel - to the best of my knowledge, this is the first estimate of the SSP scenario-forced sebsea permafrost degradation. However, there are important limitations in the manuscript, which have to be at least properly discussed before final acceptance. Thus, I vote for a major revision for the contemporary version of the manuscript.

Major comments

The mentioned in this Section comments are major. However, taking into account the novelty of the paper, I do not insist on changing the setup of simulations or on other time- and/or resource-consuming issues. However, I do guess that the ideas behind these comments have to be thoroughly discussed in the paper or, at least, to be mentioned as limitations of the obtained results.

- The most important concern is for the applied initial conditions. Authors use the SuPerMAP output, which was rerun starting from the LGM conditions to account for transients in the thermal state of the sediments. However, the length of this simulation is likely insufficient to remove the transients completely. In particular, Malakhova and Eliseev (2017, doi 10.1016/j.gloplacha.2017.08.007) showed that at least one complete glacial cycle is needed to equilibrate the thick subsea sediments. Otherwise, the initial condition-forced transients are important even at the depth of several hundred metres below the seafloor - which is certainly of importance for the results of the manuscript. Moreover, in the just mentioned paper as well as in (Malakhova and Eliseev, 2020, doi 10.1016/j.gloplacha.2020.103249), it was shown that the timescale of the permafrost response to external forcing in the middle and outer parts of the Arctice shelf is, at least, 10 kyr or even longer. This response timescale is of the order of the SuPerMAP simulation length, which again indicates possible contamination of the obtained results by the above-mentioned transients.
- Another issue is due to the application of the SuPerMAP output for initial conditions for the JSBACH models. Are the dynamic properties of these two models are sufficiently similar in order not to impose additional transients due to such implicit model change-induced shock?
- The SuPerMAP produces the subsea permafrost even in the areas which are known to lack it. Taking into account applied forcing with a strong benthic warming, this would exaggerate the rate of the permafrost thaw. Additional complications may be due to just mentioned implicit model change.

Minor comments

- l. 130: I would suggest to replace Fig. S5 by a figure in which averaging is done only over the permafrost-containing grid cells (coloured area in left panel of Fig. 1) - it would be easier to interpret in the context of the paper.
- ll. 150-165: I am confused with the definition of the permafrost area in the manuscript. Is it a total area of the grid cells which has at least a single frozen layer at some depth? Or authors limit the counting of the frozen layers only up to some (prescribed) depth? Please add the respective explicit definition to the manuscript. Otherwise the quantitative statements on the subsea permafrost area decrease are difficult to interpret.