We appreciate the reviewer's detailed and constructive feedback, which has contributed to enhancing the clarity and robustness of our study. In response, we have revised the manuscript to address all points raised and clarified the relevant sections accordingly. Below are the reviewer's comments in black, and our replies in blue.

Paleogeographic Reconstruction:
The study relies on an unpublished paleogeography from Getech Plc., which is compared with the Burls et al. (2021) reconstruction. While this offers a valuable comparison, the manuscript provides insufficient details on the paleogeographic reconstructions, and does not compare with several recent published mid-Miocene paleogeographic reconstructions. As the paleogeography is the important boundary condition that fundamentally shapes the simulated climate.

We have added some comparisons to other published geographies (Frigola et al., 2018; He et al., 2021), notably emphasising differences in the Tethys, the Fram Strait and the Panama seaway. We have moved a paragraph describing differences in paleogeographies which was in the results to the Methods section as well.

Model-Data Mismatch:
The manuscript highlights the persistent cold bias in high latitudes. It is advisable to consider adding a discussion on "seasonal deviation" of the proxy. And the discussion could be strengthened by linking this to broader challenges in paleoclimate modeling (e.g., cloud feedbacks, ocean heat transport, vegetation-atmosphere interactions).
Addition, a key concern is that the model might be over-reliant on CO_2 forcing to achieve a warmer climate, potentially at the expense of other, less constrained factors that are known to be important for warm paleoclimates, such as the role of ocean–ice interactions and their dependence on model dynamics.

We have added a comment on potential seasonal bias from the proxy record. As also mentioned by Reviewer #1, we have added some emphasis on the large error that could come from the proxy record, and not just models. Some model challenges are already discussed in our paper, for instance dynamic vegetation or polar amplification factors, which are known issues of the modelling world. We have added an extra comment discussing the lack of interactive ice sheet, which can impact high latitude temperatures.

The simulated AMOC:
The model simulation suggests a collapse of the Atlantic Meridional Overturning Circulation (AMOC) during the middle Miocene. However, the available geological evidence does not support a complete shutdown of the AMOC at that time.

Indeed, Naik et al. (2025) shows that proxy records support more an AMOC state and a collapse of a PMOC state earlier than the mid-Miocene. However, several models have managed to maintain a PMOC state under similar boundary conditions, which highlight the critical need of investigating these models (and our research) as to under what conditions this is possible and what could it indicate for future climate change. We did not discuss the collapse of the AMOC further in our paper as it is kept for a future study which is currently being worked on. Some of these comments were added around L155 and L224.

Antarctic Ice Sheet Impact:
The finding that the inclusion of an Antarctic ice sheet leads to global warming is intriguing and counterintuitive. While the authors briefly discuss this, the mechanism remains speculative. Provide the relative contribution percentages of each feedback item (cloud, water vapor, albedo, temperature) to the 1.4 °C increase. This could be a significant contribution if better explained

While the suggestion of the reviewer is definitely interesting, it represents a tremendous amount of work which is a study on its own. Splitting the contribution of each individual feedback can be done with approximate partial radiative perturbation (APRP) or online PRP, a process that would require the development of such module, its implementation in the model, re-running the simulations with usually a running time which is doubled for online PRP.