Response to the comments of Reviewer 1

I went through the manuscript by Cauquoin et al. titled *"Effects of LGM sea surface temperature and sea ice extent on the isotope-temperature slope at polar ice core sites"*. The study investigates how SST and sea ice cover have an impact on the spatio-temporal variability of the $\delta^{18}O$ vs T slope for Greenland and Antarctica precipitation between LGM and preindustrial climate. The authors used the ECHAM6-wiso model forced with different boundary conditions to test the impact of reconstructed and modeled SST/sea ice cover on simulation output. The key result of the work is that $\delta^{18}O$ vs T slope is modulated by combination of both forcing (SST and sea ice, plus AMOC for Greenland) with different weights that depend on geographical location. The authors also highlight the importance of using reconstructed sea surface boundary conditions instead of using coupled models output and specifically the needing of sea ice cover reconstruction for LGM period.

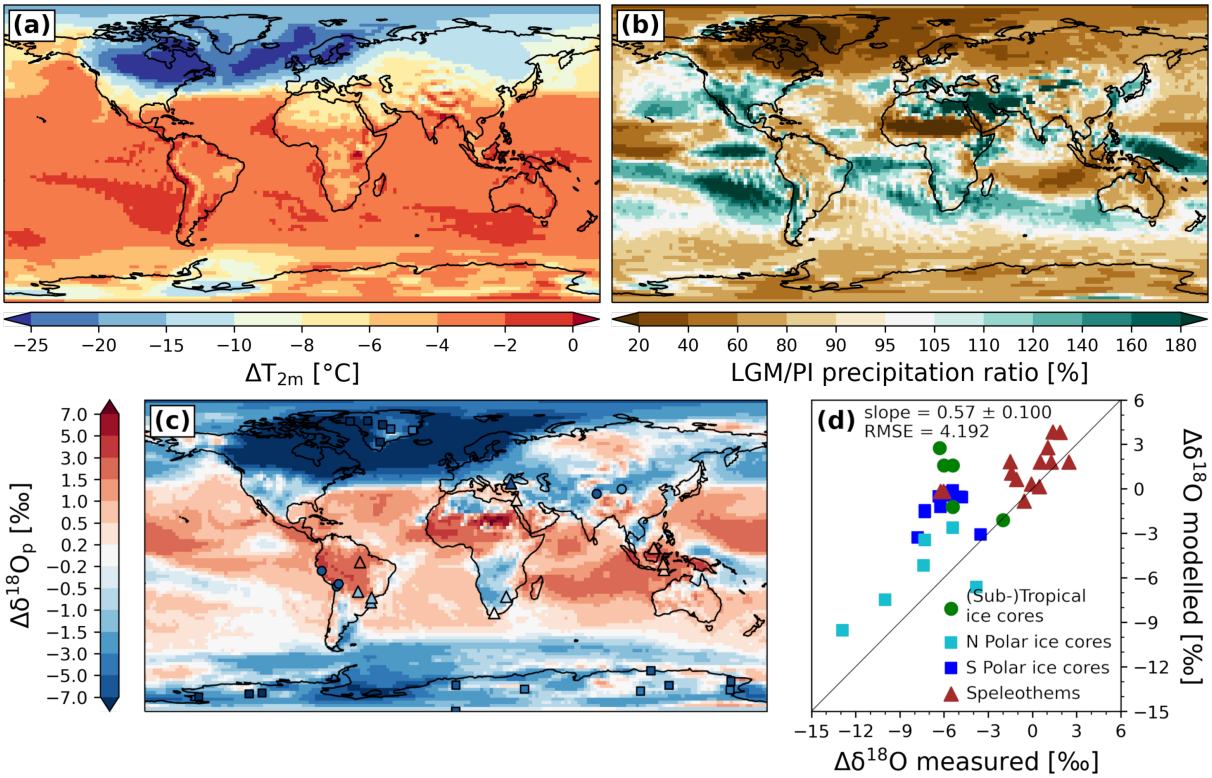
General comment

This work provides an important piece of information to the isotope - glaciology community, because it shows that **(1)** SST and sea ice conditions over source regions of precipitation have an impact on the reconstructed temperatures using stable isotopes in ice cores and **(2)** the impact on the isotope-temperature temporal slope is location-dependent over the two continents. In this context, Figure 11 clearly show where such driving forces affect more the slope and the $\delta^{18}O$ of precipitation. In my opinion, the manuscript is highly relevant for CP audience, is well written, and is easy to read. Therefore, I strongly support the manuscript for publication and I have only minor-technical comments reported hereafter:

We thank the reviewer 1 for his/her appreciation of our paper.

L225-227 and **Figure 4**. A metric to evaluate the agreement could be useful (e.g. correlation or RMSE), similar to the metrics reported in table 3 for the slope.

We added the values of slope and RMSE in the plot (d) of Figure 4. These values are reported in the Table 3 of the initial manuscript too (Figure 4 corresponds to the simulation LGM_miroc4m_sst_and_sic).



L235 This sentence is a bit vague. Are the authors referring to the spatial-temporal distribution of $\Delta_{LGM}-PI\delta^{18}O_{P}$? Or is this a "general" sentence? In that case, I would replace the word *distribution* with *fractionation*.

We replaced the word “distribution” with “fractionation” (l. 255).

L363 The scientific question guiding section 4 is very clear and it should be also posed in the introduction.

Done (l. 90-94): “Are air temperatures near the surface and the isotopic composition of precipitation in the polar regions influenced by LGM to PI changes in SST and sea ice distribution in the same way? What are the underlying dynamics, for example, in terms of changes in concentrations and transport of water vapor? To answer to these questions, we performed…”