

## Author response to the Editor

*We would like to thank the editor for her valuable feedback. Our response is in italics.*

- line 28: "contributed about"

*This has been changed.*

- line 33-35: clarify this increase refers to the thermodynamic, and not dynamic, response

*According to the comment, we have now introduced the notion of thermodynamics in the sentence as follows: "For each degree of warming, a thermodynamically driven precipitation increase of 7 % should be observed".*

- line 43: I suggest rephrasing, thermodynamics is a field of study encompassing much more than temperature changes

*Indeed, we modified the sentence as: "Thermodynamics, including the effect of higher temperatures, is one of the three mechanisms controlling precipitation variability".*

- Section 2.2: I suggest swapping the paragraph order, first introducing RACMO and then describing how the model calculates SMB, to better fit the section title

*This has been modified accordingly. First, we introduce RACMO and its ability to simulate SMB and surface processes. Then, we define SMB and its components. Finally, we explain which SMB component of RACMO2.3 we will use.*

- for the hypothesis about orographic effects potentially underlying the spatial patterns, did the authors also look at the prevailing lower level wind direction?

*We looked at low-level winds, both in terms of strength and direction. We did not see any evidence of a foehn effect, probably because either the model is unable to represent the local effect of ice rises given its resolution, or either because the ice rises are a too small topographic feature to induce a significant effect on precipitation.*

- line 427: since which half of the 20th century?

*Since the second half of the 20<sup>th</sup> century, this has been specified in the updated manuscript.*

- the manuscript essentially presents a null result, namely that spatial variability in precipitation as assessed by the RACMO and downscaling datasets does not explain the observed spatial variability in SMB. Therefore, the stated aim to "understand the variability observed in the SMB from three ice cores" is not achieved. I kindly ask the authors to adjust the text in certain places to further clarify this aspect of the paper (abstract, in the discussion, e.g. line 435).

*We have clarified the following passages in the text:*

*l.21-24: Shedding light on the intricate nature of SMB variability, our results also demonstrate that precipitation and EPEs alone cannot explain the spatial variability observed in the SMB records among the three ice core sites and suggest that other processes may be at play.*

*l.81-82: In this paper, we test the hypothesis that precipitation is the process driving the SMB spatiotemporal variability observed at the three ice rises mentioned above.*

*l.434-435: This study analyzes the spatial and temporal variability of precipitation and extreme precipitation events using the RACMO2.3 and downscaling datasets. This aims to test the hypothesis that the spatiotemporal variability observed in the SMB from three ice cores is driven by precipitation processes.*

*l.448-449: Overall, the spatial variability in modeled precipitation from the RACMO2.3 and downscaling datasets does not explain the observed variability in the three SMB ice-core records.*