Impact of boundary conditions on the modeled thermal regime of the Antarctic ice sheet – Response to Editor's Review –

We would like to express our gratitute to Dr. Benjamin Smith for his constructive review, which has significantly contributed to the enhancement of our manuscript. We have addressed his comments in a point-by-point manner below. The editor's remarks are indicated in red, and our responses are provided in black (RC).

Public justification (visible to the public if the article is accepted and published):

Line numbers refer to the Authors' Tracked Changes.

199-200: Please check wording. The model results probably suggest something about the glacier, not about the experiments.

Done.

246: consider rewriting as: "plays a more important role in the thermal model than does diffusion"

Done.

247: "The primary difference between BIS…" - it might be better to say "A likely explanation for the difference in the misfits between BIS…"

Done.

306: The phrase as written (which I may have partially provided in my last report on this manuscript) is not entirely correct. I'd suggest rewriting this sentence as something like: "This history results in colder temperatures in the upper part of the ice column, which contains ice that was deposited farther upstream where the surface temperature was lower than it is at the current location of the boreholes. This ice was then transported downstream to the current location." The best citation for

this idea that I've found is a very recent paper:

Hills BH, Christianson K, Jacobel RW, Conway H, Pettersson R (2023).
Radar attenuation demonstrates advective cooling in the Siple Coast ice streams. Journal of Glaciology 69(275), 566–576. https://doi.org/10.1017/jog.2022.86

Done.

339-341: I suggest:
"We confirm that in areas where the bed geometry was inferred from mass continuity, the more accurate estimates of the vertical velocity provide a viable input for estimates of temperature profiles, for example in the Siple Coast fast-flow regions."

Done.

The editing team, Polina Shvedko, noted that the color schemes in Figure 5, representing the geothermal heat flux, basal melting rate, and the difference between basal melting rates, seem similar, impacting readability.

> Notification to the authors:
> Regarding the figure 5: please ensure that the colour schemes used in your maps and charts allow readers with colour vision deficiencies to correctly interpret your findings. Please check your figures using the Coblis – Color Blindness Simulator (https://www.color-blindness.com/coblis-color-blindness-simulator/) and revise the colour schemes accordingly.

Therefore, Figure 5 has been revised as follows:

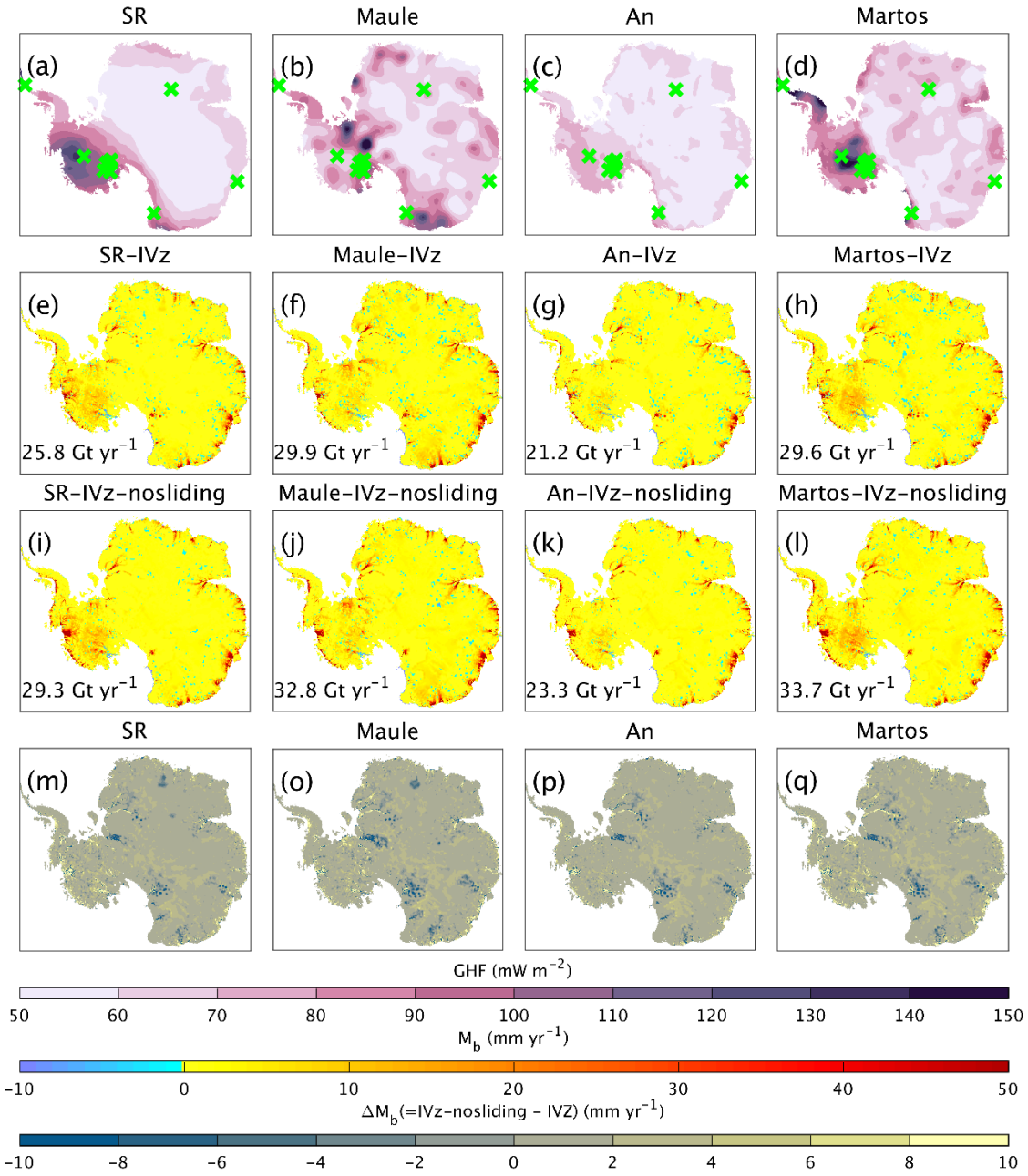

Figure 5. Upper panels (a-d) are the geothermal heat flux distributions of each source. Middle panels (e-l) are the basal melting rate distributions, with the value at the bottom left indicating the total grounded ice melting volume for each experiment. The basal melting rate exceeding 50 mm yr^{-1} is truncated. Lower Panels (m-q) are difference in basal melting rate between IVz-nosliding and IVz for each geothermal heat flux. A green cross dot on the geothermal heat flux map indicates the borehole location. The color maps for the geothermal heat flux and the difference in basal melting rates are from Crameri et al. (2020).