Review of manuscript tc-2023-76 "A model framework on atmosphere-snow water vapor exchange and the associated isotope effects at Dome Argus, Antarctica: part I the diurnal changes" by Tianming Ma et al.

General comments:
The authors have mostly (see Comment L.147) addressed the flaws in the latent heat flux calculation and the model theory. Sufficient uncertainty and sensitivity analyses are performed, yet the outcomes of these analyses or their implications for the results' robustness are not addressed in the discussion. I suggest adding a discussion of the results' robustness based on the sensitivity analyses in 3.4, Text S4, and Text S5 before publication.

The authors have now simulated the impact of vapor fluxes for a continuous time series at Dome C. However, for Dome A, their simulation is still based on average diurnal cycles of the input data. To assess how averaging the input data might affect the results (see Comment L.416-417), I suggest one additional simulation for Dome A with continuous input data, regardless of the cloudiness.

The authors make statements at several points in the manuscript (e.g., Comments L23., L.397, L.463-464, L.475-477) without providing sufficient evidence. I kindly ask the authors to revise such statements and reformulate them appropriately. I further suggest conducting a comprehensive language revision of the manuscript, as occasional imprecise formulations may lead to misinterpretation. Lastly, in its current form, the manuscript is missing references to figures and supplemental material wherever relevant. This makes it difficult to follow the authors' explanations, and I strongly advise providing all references before the publication of this manuscript.

Detailed comments:

- L.23: Please add: under "average" summer clear-sky conditions. It is important to distinguish the isotopic impact of an average clear-sky from the average impact during all clear-sky days, as both cases could differ significantly.
- L.28: Please clarify what is meant by "more or less".
- L.54: Estimates of the long-term effect of atmosphere-snow water vapor exchange on the snow isotopic composition in Greenland have been done by Dietrich et al. (2023), but not yet in Antarctica.
- L.144 (and others): I suppose the used Formula is either the "August–Roche–Magnus Formula" or the "Magnus Formula" to calculate the saturation-specific humidity since q_s cannot be directly calculated from the Clausius-Clapeyron Equation? Please add the name of the used formula.
- L.144, L.146, Table S1: Please correct to "Clausius-Clapeyron".
- L.147: If I understood correctly, you set the correction term Ψ_M to zero. Firstly, this needs to be stated in the manuscript. Secondly, under the mostly stable conditions in polar regions, the stability correction terms Ψ_M and Ψ_q cannot be neglected. Please include Ψ_M and Ψ_q in your latent heat flux calculation. E.g. following Holtslag and De Bruin (1988) for stable conditions (assuming Ψ_M=Ψ_q), and Paulson (1970) unstable conditions.
- L.261: Typo: negative -31.01°C
- L.269: Why is it relevant to mention stellar images here? Please remove or clarify.
- L.291: I presume data from the model "ECHAM5-wiso" is used (Werner et al. 2011).
- L.360: Diurnal changes, not cycles.
- L.397: Neither of the three figures supports this statement since none shows isotopic values.
- L.407-408: Please reference Text S4 here.
- L.411: Liu et al. (2022) are not in the reference list.
- L.413-416: "We noticed": Where are these diurnal changes shown? Or is it Liu et al. (2022) who show these changes? I furthermore assume that it is a 200‰ change in δD, not in d-excess.
- L.416-417: The given numbers correspond to the diurnal variations, not the absolute values of δD. Please correct. In addition, where do the values for Kohnen and Dome C come from? Please update the text with the references.

- L.416-417: In the supplements is shown that an increased wind speed variability leads to a larger diurnal magnitude of the vapor δ^{18}O. I suspect the lower diurnal magnitude to be a consequence of the averaged meteorological input. This could be tested by running an additional simulation for Dome A with continuous meteorological input without distinguishing between cloudy and clear-sky days. Please add a sentence that references and discusses the results from Figure S3.
- L.420: Vertical convection or horizontal advection?
- L.439-440: Figures 4 and 5 show no general vapor depletion. I suggest removing the second part of this sentence.
- L.463-464: The presented results and figures do not provide sufficient evidence that allows a statement regarding the long-term isotopic impact of vapor exchange. Please provide evidence or remove this statement.
- L.475-477: The evidence for this statement is missing.
- Figure 4d: The line for the snow isotopic composition is missing in the figure.
- Figure 4 and Figure 5: Please choose the same y-axis ranges for Fig. 4 and 5.
- Text S4, L.123-126: Figure S2 shows that the vapor δ^{18}O is strongly underestimated in Case II (turbulent mixing for Ri¡0.1). The written text suggests the opposite.
- Figure S3: Typo in legend of "Water vapor δ^{18}O-Case II"

L. J. Dietrich, H. C. Steen-Larsen, S. Wahl, T. R. Jones, M. S. Town, and M. Werner. Snow-atmosphere humidity exchange at the ice sheet surface alters annual mean climate signals in ice core records. *Geophysical Research Letters*, 50(20):e2023GL104249, 2023. doi:10.1029/2023GL104249.

A. Holtslag and H. De Bruin. Applied modeling of the nighttime surface energy balance over land. *Journal of Applied Meteorology and Climatology*, 27(6):689–704, 1988.

C. A. Paulson. The mathematical representation of wind speed and temperature profiles in the unstable atmospheric surface layer. *Journal of Applied Meteorology and Climatology*, 9(6):857–861, 1970.

M. Werner, P. M. Langebroek, T. Carlsen, M. Herold, and G. Lohmann. Stable water isotopes in the echam5 general circulation model: Toward high-resolution isotope modeling on a global scale. *Journal of Geophysical Research: Atmospheres*, 116(D15), 2011. doi:10.1029/2011JD015681.