

Dear Dr. Smith,

Please find our revised manuscript "A Model Framework on Atmosphere-snow Water vapor Exchange and the Associated Isotope Effects at Dome Argus, Antarctica: Part I the Diurnal Changes " by Ma et al. We really appreciate that you take the time to handle this manuscript and give the comments/recommendations. In the revised manuscript, we have addressed all the comments and made corresponding changes/corrections.

The revisions to the manuscript were concentrated on the precision of numerical values. The inappropriate words or phrases have also been corrected following the suggestions. In addition, we have undertaken a thorough language revision of the manuscript and corrected other writing errors. We hope these efforts will further improve manuscript.

We confirm that this manuscript has not been published elsewhere and is not under consideration by another journal. All authors have approved the manuscript and agree with its submission to The Cryosphere. Please address all correspondence to genglei@ustc.edu.cn. We look forward to hearing from you at your earliest convenience.

Sincerely,

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Response to Editor's Comments

1) L.26-27: Please check significant figures. Variabilities should be expressed to at most two-digit precision, values should be expressed to no more precision than the variability: thus,

4.75 +- 2.57 -> 4.8 +- 2.6

28.8 +- 19.06 -> 29 +- 19

Please fix this throughout the manuscript. I will mention it where I see it, but will likely not see everything.

Response: Thanks for this suggestion. We have examined all numerical values throughout the manuscript and have revised their precision accordingly. The specific modifications and their corresponding lines in the manuscript are as follows:

Line 26: 4.75 +- 2.57 -> 4.8 +- 2.6, 28.8 +- 19.06 -> 29 +- 19

Line 27: 1.64 +- 2.71 -> 1.6 +- 2.7

Line 90: 1-1.5 ->1.0-1.5

Line 104: 1.99 ->2.0

Line 277: 10.38 ->10, -31.01 ->-31

Line 278: -38.69 ->-39, -27.67 ->-28

Line 281: 2.98 ->3.0, 3.34 ->3.3

Line 346: 2 ->2.0

Line 369: 4.75 ->4.8, 28.75->29, 9.25->9.3

Line 371: 1.64 ->1.6, 4.85->4.9

Line 372: 2.35 ->2.4, 15.67->16, 3.13->3.1

Line 373: 1.09 ->1.1, 1.26->1.3

Line 382: 3.00 ->3.0, 21.15->21, 4.02->4.0

Line 383: 2.21 ->2.2

Line 461: 28.78 +- 19.06 ->29 +- 19

2)L.91: By 2015/2016 -> "By the 2015/2016"

Response: Corrected.

3)L.95: "processing, especially" -> "processing. In particular,"

Response: Corrected.

4)L.96: add comma after important

Response: Thanks, added.

5)L.101: delete "experience"

Response: Corrected.

6)L.104: "found on average" -> "found that on average"

Response: Corrected.

7)L.105: 1.99 -> 2.0

Response: See details in the Response to Comment 1).

8)L.123: “i.e.” –“:”

Response: Corrected.

9)L.144: *Ls should be L-sub-s. One of the referees found this in the last review! Please check that all edits suggested by referees were actually made.*

Response: Sorry for our careless. This mistake has been corrected. We also have reviewed all the comments provided by the referees and are confident that no issues have been overlooked in the revised manuscript.

10) L.260: “across different cases”: *Please give an example or two of the kind of cases compared.*

Response: In Section 3.2.4 and Figure 7, we have shown the results of all six cases for continuous simulations at Dome A. To make it clear in the section of method, the reminder for readers has been added in the end of this phrase.

11)L.261: “can be” -> *were*

Response: Corrected.

12)L.277-278: *Check significant figures.*

Response: See details in the Response to Comment 1).

13)L.285: “seeing—” -> “visual observations of”

Response: Thanks, corrected.

14)L.287: “mm w. eq. y.” -> *mm yr-1*

Response: Corrected.

15) L.305: *do you mean negative values of the latent heat flux?*

Response: Yes. In order to avoid ambiguity, we deleted the word of ‘calculated’ in front of ‘latent heat flux’.

16)L.305-06: “within diurnal variations in the wintertime”: *Please be more specific about the sign of the variations as it relates to the sign of the heat flux (if that is what is under discussion here)*

Response: We rephrased the paragraph to emphasize that the latent heat fluxes in Dome A winter are persistently negative and exhibit stable diurnal fluctuations. The revised paragraph is as follows:

The stacked hourly mean values of winter meteorological conditions at Dome A were extracted in the same way as we did for the summer conditions. As shown in Fig. 2c, the average temperature, specific humidity, and atmospheric pressure are lower than those in summer, but the relative humidity increases during winter. These changes result

in the negative values of latent heat flux during winter. In addition, the winter meteorological parameters and latent heat flux do not show any apparent diurnal variations.

17)L.340-341: increased-> increases, decreased -> decreases

Response: Thanks, corrected.

18)L.342: Please explain what variables are being correlated here.

Response: The correlations between water vapor $\delta^{18}\text{O}$ and δD are not clearly described in L342. We rephrased this sentence as follows:

The diurnal patterns in water vapor δD are similar to that in water vapor $\delta^{18}\text{O}$ and their max-min difference is $\sim 54\%$ (Fig. 3b).

19)L.370-374: check significant figures

Response: See details in the Response to Comment 1).

20)L.390: “comparison with “ -> “contrast to”

Response: Corrected.

21)L.392: “unchanged” -> constant”

Response: Corrected.

22)L.400: “However” -> “In addition,”

Response: Corrected.

23)L.402: “its” -> their

Response: Corrected.

24)L.403: Please specify what tendency. Also, please consider whether tendency or trend is the more appropriate word.

Response: Thanks for this suggestion. We used the ‘diurnal cycles’ to specifically describe the pattern of continuous simulations at Dome A. The revised sentence is as follows:

The diurnal cycles shown in the Dome A continuous simulations are consistent with the simulated results at Dome C.

25)L.407-422: Please remind the reader what parameters were tested in each group of tests. This should be done in the topic sentence for each paragraph.

Response: We appreciate this valuable suggestion from the editor. In the Section 3.3, we have revised the topic sentence of each paragraph to explicitly state the parameters that were evaluated in the respective groups of tests.

26)L.408: Provide a reminder for what H_0 and h_0 represent

Response: To remind the reader, we used the full description of H_0 and h_0 in this

sentence. The details are as follows:0

In the first group of tests (Fig. 8a), the magnitude of the diurnal variations in water vapor $\delta^{18}\text{O}$ ($\delta^{18}\text{O}_v$) is highly influenced by the boundary height (H_0) but not by snow depth (h_0).

27)L.425: delete “two”

Response: Thanks, corrected.

28)L.441: add “with” after “vapor reservoir”

Response: Added.

29)L.452: Please specify which two input parameters

Response: In the revised manuscript, we rephrased the sentence as follows: However, in the model employed for this study, the boundary layer height (H_0) and water vapor isotopic composition in the free atmosphere layer (δf_0) are maintained as constants to simplify the calculations, whereas they vary daily in reality.

30)L.460: Check significant figures

Response: See details in the Response to Comment 1).

31)L.464: orientation-> direction

Response: Thanks, corrected.

32)L.469: Please explain what calibration might be drifting

Response: As stated in Liu et al., (2022), the extremely low water vapor content at Dome A is a crucial reason for calibration drifting. Here we made this point very clear in the sentence as follows:

This large discrepancy may be due to calibration drifts caused by the low water vapor content during the measurements at the nearest Dome A site (Liu et al., 2022).

33)L.475: “only variable”: do you mean “only” or “most significant”?

Response: The phrase of ‘most significant’ is more accurate. Thus, we made a revision in this sentence.

34)L.476: join the two sentences, replacing “with the presence of clouds” with “and, “.

Response: Corrected.

35)L.506: replace 2 occurrences of “would” with “should”

Response: Corrected.

36)L.511: “in terms of evaluating” -> “To evaluate”

Response: Corrected.

37)L.513: *would* -> *should*

Response: Thanks, corrected.

38)L.514 "*it should be noted*" -> "*we note*"

Response: Corrected.

39)L.533: "*not comparable to (i.e. lower than)*" -> "*smaller than*"

Response: Corrected.

40)L.535: *delete "wanted to"*

Response: Thanks, corrected.

41)L.539: "*On the other hand*" -> "*Further,*"

Response: Corrected.

End of Response