

RESPONSE TO ANONYMOUS REFEREE #2 COMMENTS
TO MANUSCRIPT tc-2017-16-RC2

Title: Experimental observation of transient $\delta^{18}\text{O}$ interaction between snow and advective airflow under various temperature gradient conditions

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We thank the anonymous referee #2 for his very constructive comments and suggestions. All line numbers correspond to the discussion paper.

ANONYMOUS REVIEWER #2

The manuscript is devoted to the results of the laboratory experiments aimed to study the post-depositional changes of snow isotopic composition due to interaction of snow matrix with water vapor. The processes occurring in snow after the snow precipitation is deposited are one of the least studied and understood elements of the formation of the climatic signal of an ice core isotopic profile. Thus the present work is timely and up-to-date. The obtained results are clear and convincing so I think the manuscript may be accepted with minor corrections. My suggestions to improve the manuscript are as follows: I do not agree that the “results represent the first direct experimental observation showing interaction between the water isotopic composition of the snow” (line 467-468), since several similar laboratory experiments have been already contacted (e.g., Sokratov & Golubev, 2009). I think this work would benefit from short discussion of the previous studies. Second, I suggest to shorten or completely eliminate the long discussion of an experiment that has not been conducted yet (lines 412-432). Finally, some sentences look awkward or not finished. One of the examples is on the lines 361-362, but there are some more in the text. So I ask authors to look through the text more carefully.

Reference: Sokratov, S.A. and V.N. Golubev 2009. Snow isotopic content change by sublimation. *J. Glaciol.*, 55(193): 823-828.

Response to comment #1: We added a short discussion of the previous studies.

Line 262: “The results also support the statement that an interplay between theoretically expected layer-by-layer sublimation and deposition at the ice-matrix surface and the isotopic content evolution of snow cover due to mass exchange between the snow cover and the atmosphere occurs (Sokratov and Golubev, 2009). The specific surface area of

snow exposed to mass exchange (Horita et al., 2008) and by the depth of the snow layer exposed to the mass exchange with the atmosphere (He and Smith, 1999) plays an important role.”.

Citation added

Sokratov S.A. and Golubev V. N.: Snow isotopic content change by sublimation. *Journal of Glaciology*, 55(193), 823-828, 2009.

Horita J., Rozanski K., and Cohen S.: Isotope effects in the evaporation of water: a status report of the Craig-Gordon model, *Isot. Environ. Health Stud.*, 44, 23-49, 2008.

He H. and Smith R. B.: An advective-diffusive isotopic evaporation-condensation model, *Journal of Geophysical Research*, 104, 18619-18630, 1999.

And we changed the sentence in line 467-468

Line 467-468: “Our results represent direct experimental observation ...”.

Response to comment #2: We agree with the reviewer and removed this description, as it takes up not completely resolved questions already posed in the paper by Horita et al. (2008) (Line 412-432).

Response to comment #3: Thank you for the comment. We will check and correct the manuscript where appropriate (see revised manuscript).

Minor revisions were made throughout the revised manuscript.

We thank Anonymous Referee #2 for his insight, suggestions and recommendations.

The authors