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The Cryosphere Discussions

Interactive comment on "Pingo development in Grøndalen, West Spitsbergen" *by* Nikita Demidov et al.

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The authors present stratigraphic profiles of solutes and water isotopes from pore ice of permafrost cores collected from the Fili pingo in West Spitsbergen, and of modern precipitation, tributaries, and a local spring to better constrain the origin of water in the pingo system. Based on the data, the authors deduce that the pingo is spring-fed, and that its evolution was characterised by several distinct periods of closed and semi-closed conditions, as evidenced by trends in the water isotope and solute data. They also use a Rayleigh isotope distillation model to show that the data diverge from a closed-system. I found the methods and interpretation were robust. The paper was well written, easy to follow and the topic is well suited for The Cryosphere. Below are several comments meant to help the authors improve the communication of their work,

and address one uncertainty that is not discussed. Following these minor revisions I would recommend this paper for publication.

Major comments. I am intrigued by the vertical trends in the water isotope dataset. To a large extent I agree with the interpretation assuming the following conditions: core #9 was drilled exactly in the centroid of the ice body; pingo geometry is conical; and it is reasonable to assume the pingo grew equally on all sides. Largely these points are not discussed. Isotopic stratigraphy of pingo ice could show 'apparent' reversals if the coring angle was off-axis, or pingo growth was asymmetric. Perhaps the authors can comment on this uncertainty. Again, I am in agreement with the interpretation, but would appreciate if this issue of coring angle and pingo growth geometry could be discussed.

Minor comments. Abstract. The final 2 sentences are largely unconnected to the research. Please finish the abstract with some kind of significance statement instead.

P2, L20-22. this sentence is too wordy, and confuses the message. please make it more concise.

P2, L24-26. please elaborate on why this is true.

P3, L26-27. the description of core thickness in relation to different baselevel elevations is a bit confusing. Please clarify in simple terms.

P6, L17. the reported dD-d18O and d-dD slopes (6.7 and -0.2, respectively) are nearly identical to the slopes observed in modern precipitation. Fig. 3 indicates dD-d18O slope is 6.78, and based on the dD-d18O equation the d-dD slope can be calculated to -0.18 (or -0.2 if rounded to 1 decimal). My point is, your claim that the effects of freezing on the co-isotope slopes are not well supported by the data, since precipitation has these slopes.

P9, L19-20. it is unclear how the previous sentence justifies this conclusion. please elaborate.

P10, L12-13. If true, you may be able to calculate the rate of pore water recharge based on deviation from isotope distillation model.

P12, L10. . . .valley evolution can already ‘be’ drawn.

Figures. The font size and resolution of some of the figures is too low for publication, and in some cases it was difficult to interpret the figures as given. Please revise to conform to the publication standards of The Cryosphere.

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