egusphere-2026-510 - Some insights from the second principle of thermodynamics for snowpack modeling Answer to P. Marquet

We thank Pascal Marquet for taking the time to post this insightful comment on our manuscript and for providing an in-depth list of references. It is true that our study does not consider the presence of different isotopologues, which might be relevant in the future for ice core interpretation. Moreover, as the model is intended to be applied far away from the absolute zero, we did not enforce consistency with the third-law (that would require for instance that the thermal capacity vanishes at 0 K), but this was not mentioned in the text.

We will follow Pascal Marquet's comment and provided references, and we will specify **L733-736**:
Among the missing mechanisms/processes, we can mention the presence of liquid water, thus with phase changes and liquid water percolation under gravity and capillary effects, the mechanical compaction of the snowpack under its own weight, and the presence of water isotopologues. For the latter, it would be necessary to distinguish the different species present in the gas and solid phases, each having different molar entropy values (as those, for instance, provided in Table 2.7 of Atkins and de Paula, 2006)

Concerning the third principle, we will also add **L444**:
Note that since the model is to be applied far from the absolute zero, we do not enforce consistency with the third principle of thermodynamics, which would for instance require thermal capacities to vanishes at 0 K (Kardar, 2007).

The authors of egusphere-2026-510

References

Atkins, P. and de Paula, J.: Atkins' Physical Chemistry, Oxford University Press, 2006.

Kardar, M.: Statistical Physics of Particles, Cambridge University Press, https://doi.org/10.1017/CBO9780511815898, 2007.