

Three-phase numerical model for subsurface hydrology in permafrost-affected regions

Response to Reviewer #1

Comment 1: For this, will only review the PFLOTTRAN implementation and scalability description. In particular, the paper seems to emphasize the scalability of the PFLOTTRAN-based implementation to solve the balance equations of mass and energy for the water component; for this, I would recommend to expand more the part where the implementation is described as in the current version, no details are provided on why the proposed method scales. It is only because of the initial assumptions? Is there an explanation why the scalability point is at 1K cores? Was the potential limitation of the Newton-Krylov iterative process considered as a possibly scalability reducing factor?

Response: An explanation for the scalability will be added to the implementation section.

Comment 2: There seems to be discrepancy between what is stated in paragraph 2.4 (Solution methodology) and the caption in Figure 1: When considering 12 million degrees of freedom, the system scales seems to scale at 2K cores (at 4K cores does not really seems to bring any consistent advantage in respect of the considerable size of the system required).

Response: We will fix the discrepancy.

Comment 3: Finally, a comparison with a more “commodity” system would also help understand the possible impact of the proposed solution (not everybody can afford a Jaguar Cray XK6).

Response: A scaling comparison on a 64-core machine will be added to the paper.