

## ***Interactive comment on “Spatially-distributed tracer-aided runoff modelling and dynamics of storage and water ages in a permafrost-influenced catchment” by Thea I. Piovano et al.***

### **Anonymous Referee #1**

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This study contributes to improving the understanding of runoff generation in an alpine discontinuous permafrost setting. It makes use of a conceptual model to simulate the seasonally changing stable isotope signature in the water of a small catchment. The STARR model used has been described in published literature, but the present paper applies the model in a spatially distributed fashion to study the ‘age dynamics’ of water storage and generated flow. The simulations show the displacement of old water from soil storage to the stream during snowmelt and the role of organic soils is explained. Figures 6 and 7 provide convenient summaries of the spatial distribution of soil storage and water age in the course of two years.

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The Introduction section may be considered by some to be too lengthy but since many readers may not be familiar with the hydrological environment of the subarctic, such an extensive presentation can be helpful. I note that in Figure 4e, the range of the best 100 runs of stream water age has a considerably wider spread of values above than below the median. Is there an explanation for this asymmetry? The paper reads well, but some minor editorial changes are needed. p. 8, line 15: two open brackets in a sentence - in front of the word 'approximately' may be a comma? p. 10, line 22-23: I do not understand the phrase "as overland flow and only occasionally simulated during melt". p. 13, line 30: I do not understand "their high porosity allow several hundred mm of total water storage when saturated and large amounts at field capacity". p. 13, lines 34-35: "infiltrating meltwater supplies latent heat to bring soils to freezing". I thought the addition of latent heat would raise the soil temperature and not bring it down to freezing. p 14, line 4: "which are inked to conditions (of) the previous fall" – the word 'of' is missing.

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