

Interactive comment on “Coupled Land Surface-Subsurface Hydrogeophysical Inverse Modeling to Estimate Soil Organic Content and explore associated Hydrological and Thermal Dynamics in an Arctic Tundra” by Anh Phuong Tran et al.

Anonymous Referee #2

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I enjoyed reading your paper and the authors of the paper describe an interesting combination of coupled hydrogeophysical inversion using also thermal properties. The investigation of uncertainties and to analyze the influence of different data sets to improve the results is a very interesting topic and highly important for coupled inversions. Coupled hydrogeophysical inversions have been widely used in the last years, but the extension to thermal parameters is still rare. Generally, I think the paper is well written and all the important steps are nicely explained. I have some minor comments that

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could help to make some things clearer and improve the manuscript. After addressing them I recommend publication.

1. Introduction: Please discuss in more detail coupled hydrogeophysical inversion in terms of other geophysical methods. What are the benefits of ERT compare to GPR or seismic and why did you prefer this for you study. Mention the resolution of different methods and what are the limitations of what can be obtained.

2. Regarding the ERT data: a. Page 13: It would be nice to show also one ERT transect from the measured data and indicate the defined boundaries and structures in there. b. Please give more information of the ERT and the inversion. How reliable are the ERT results at a depth of 0.1m when using a spacing of 0.5m? c. Page 14, last paragraph: Considering measurement errors are highly important, but did you also consider uncertainties of the actually layer thicknesses obtained by the ERT? d. Page 15: Why do you use just 7 data set of the ERT, when you have data available for every day?

Technical corrections: The manuscript is very detailed, which is generally very good, but please try to remove unnecessary sentences to shorten the text and to better concentrate on the results. Avoid sentences like “Figure XX shows...”. I listed here some examples that could shorten the text. Please check this for all the location where figures and tables are introduced. For example: e. Page 17: last paragraph. The three sentences can easily be combined to one. f. Page 18 starting line 4: First sentence not necessary and combine with second sentence. g. Page 19, second paragraph: Rewrite to “The comparison between synthetic and predicted apparent resistivity data (Figure 14) shows that there is a very good agreement between them with no bias.

Congratulations on a very nice job!

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