

## ***Interactive comment on “Submarine groundwater discharge site in the First Salpausselkä ice-marginal formation, south Finland” by J. J. Virtasalo et al.***

### **Anonymous Referee #2**

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#### – General comments –

The authors present a study using onshore and offshore methods for tracking SGD into the Baltic Sea at the southern coast of Finland. Focusing on SGD, this manuscript addresses an often disregarded and therefore still relatively unknown segment of the water cycle. More knowledge on this part of the water cycle is thus highly appreciated and the study therefore topical and important. In my opinion, the highlight of the study is the Radon-222 approach since the measurements were realized with a continuous sampling mode, which is crucial for SGD detection, and since it provides the essential results for the study. The suite of geophysical methods the authors applied is impres-

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sive. The description and interpretation of the seismic/radar profiles is very detailed. I appreciate this thorough data analysis, however, I think that there is too much detail given the fact that the overall aim of the study should be the characterization of SGD. Thus, I consider the geology part and the discussion of the different geophysical methods as overrepresented in the manuscript, in particular since the title of the manuscript is clearly focusing on SGD. I therefore wish that the authors tailor the geological information more to the primary focus of the manuscript. The link between SGD and the geology could be better established by essentially discussing the aquifer properties (hydraulic conductivity  $K$ , continuity of deposit) of the different geological units. This asks for some restructuring of the manuscript, as well as for more information on the pockmarks and on the hydrogeology of the geological units in the area. Overall, I recommend this study for publication after the proposed modifications have been applied. With the strong water focus the manuscript might not fully fit into the scope of Solid Earth, however, I find studies that do not consider the solid Earth and the hydrosphere in isolation particularly important.

#### – Specific comments –

I copy here my three major specific comments. Further smaller comments are included in the annotated PDF.

**Pockmarks:** The pockmarks should be better represented and described; in Figure 2 and in the text including their diameter and depth. They are the hot spots of SGD in the study area but no details are provided. This will also allow a comparison with other pockmark studies in the North and Baltic Sea, and in particular a comparison with pockmarks characterized by gas seepage.

**Section 5.1:** Overall, I do not see the use of this section for answering the question of SGD. I understand that the authors wish to discuss the advantages/disadvantages of the different methods but this is secondary to the primary aim of the study, if and where SGD is active. At least the order of the discussion sections should be changed

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(change section 5.1 to 5.2), and if the present section 5.1 is kept the authors should elaborate more on the usefulness of these methods in relation with SGD research.

Estimation of SGD rate (p. 14, lines 24–30): This estimation is way too straightforward. The distance between the pockmark surface and the thermocline is about 4 m, within this 4 m the groundwater Radon-222 signal is certainly strongly depleted by seawater. Only if there is something like a water jet, i.e. a very fast upward flow, mixing could be limited. Hence, it would be better to delete this estimation here. However, I fully agree that a quantification is important. A monitoring of currents between the pockmark and the thermocline would be a first approach in this regard.

– Technical corrections –

See annotated PDF.

Please also note the supplement to this comment:

<https://www.solid-earth-discuss.net/se-2018-131/se-2018-131-RC2-supplement.pdf>

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Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2018-131>, 2018.