

## ***Interactive comment on “Potential permafrost distribution and ground temperatures based on surface state obtained from microwave satellite data” by Christine Kroisleitner et al.***

### **Anonymous Referee #2**

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The authors present a satellite-based approach for estimating the mean annual ground temperature and permafrost extent on a circum-arctic scale. The key input for inferring these two quantities is the length of the frozen season, an estimate of which can be derived from microwave satellite data.

I have difficulty in making out the manuscript’s focus, as neither of the two central claims seems to be sufficiently borne out by the authors’ analyses. The two claims are i) that ASCAT can provide valuable information on the MAGT and on permafrost extent; and ii) that choosing a threshold value for determining permafrost extent is a delicate operation, a fact that was glossed over in a paper by Park et al.).

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If i) were the central contribution, the approach's opportunities and limitations would have to be analysed in more detail. Does it provide an improvement over existing techniques? What are the uncertainties? A detailed assessment of its limitations (regional differences; impact of non-uniform conditions in climate, snow, soil, vegetation, etc.; scale issues) would be required. If ii) were the central contribution, a commentary on Park et al. would suffice unless the analyses were extended greatly. They should provide insight into the difference between the microwave data used by Park et al. and ASCAT, and into the applicability of a single threshold value across diverse regions.

Another aspect that I think deserves more attention is the definition of permafrost presence on a 25 km scale. This becomes obvious in the comparison to Brown's permafrost map, as the binary state of presence/absence is compared to multiple permafrost categories. The associated assumptions are not discussed in sufficient detail, and neither are the limitations of this reference map (age, scale, accuracy).

#### Minor points

The manuscript contains numerous errors in grammar and spelling. In the first paragraph of the introduction alone, it's should read its and extend extent.

pg 5, 6-8: "The minimum MAGT, in a stable climate, would be the same as the MAGT at the depth of ZAA, but due to climate variations the coldest annual temperature is often recorded below the ZAA (Lachembruch and Marshall, 1986)". I do not quite know what to make of this sentence. It is not difficult to come up with plausible counter-examples (e.g. heat flux boundary condition at great depth, seasonally variable temperature boundary condition at the surface). Furthermore, it is not only the climate that is assumed stable, but also the vegetation, etc.).

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