

Interactive comment on “In situ measurement of low-frequency sea-ice dielectric properties and implications for tracking seasonal evolution of microstructure” by M. O’Sadnick et al.

Anonymous Referee #2

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The authors report in-situ measurements of sea ice in the 10 Hz to 100 kHz range. I really enjoyed reading the important and well-written contribution and admire the methodology, which finally leads to authoritative conclusions. The cross-borehole technique is, compared to the studies of Buchanan et al., suitable to determine the dielectric properties of sea-ice in situ and record their evolution throughout a season. The originality of the paper is to compile these electrical data along with other meteorological, chemical, physical and microstructural properties of ice samples from the nearby vicinity. The named further parameters are determined by means of established standard methods. Therefore, the paper is of high scientific quality. Where the aspect of an appropriate and balanced discussion seems to be fulfilled in relation to the cited literature. To my

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knowledge there is no contradicting or ignored work to the field, but my own profile is only in a wider related field. For the same reason I'm more careful when judging the impact, but to my impression the present work can be the impetus for mayor developments to the field.

I agree with referee #1 that if the paper is meant to make a useful dataset available, the correlation analysis is overshooting the mark. On the other hand from reading the title a little bit sloppy I would have expected a discussion like e.g. in Buchanan et al. 2012, where the particular electrical properties, like e.g. extremely high permittivity due to Maxwell-Wagner type relaxations at internal structures, are related to microstructural and chemical properties of the sample. Somehow I had expected to read more about the relation of electrical properties to structural properties by application of suited models in the same way as in Buchanan et al., 2012. But by stating "Implications" the title is conservative and does not promise the "Relations" I had hoped for. From really undertaking this investigation in natural sea ice I expect a lot of pitfalls, as e.g. homogeneity issues. I again agree with referee #1 that for this purpose a lot of more investigation has to be undertaken. On the other hand I find the statistical analysis useful as it is a first step approach to a new field and I enjoyed reading it. In my perception I also agree with referee #1 that the methodology of Buchanan and along the conclusions go much beyond what you have achieved here. But I encourage you to pursue the in situ work in natural sea ice, which is of course far more complicated but when performed in a Buchanan et al. like approach also of far more impacting compared to experiments in lab grown samples. In this sense, your work can be the impetus for much easier estimation of e.g. microstructural properties from electrical measurements. I hope I contributed some more suggestions for your decision how to overwork section 3. And of course encourage you to continue your experiments and pursue their interpretation towards the estimation of microstructural properties of the ice.

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