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Interactive comment on "Quantifying multifrequency acoustic characterization accuracy for ice model development applications" *by* David R. Topham and John R. Marko

Anonymous Referee #1

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General comments:

I do not think the majority of this manuscript will be of interest to the readers of Cryosphere; its content is too theoretical. Moreover, in its current form the manuscript meanders to much from theory to lab, back to theory, to field, and so on. The manuscript reads more like a diary of the trials and tribulations of the research undertaken by Topham and Marko over a number of years rather than a focussed manuscript. That said, I think the paper contains some very useful results.

I am not a theoretician. I study river ice freeze-up and frazil events.

The manuscript looks at the theoretical work on using multi-frequency transducers (at

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Discussion paper

least 3) to determine the number of particles per unit volume, N, mean effective radius, a_m, and standard deviation, b. Previous work has used 2 frequencies, which yields N* and a*, the numbers particles per unit volume, and the uniformly-sized radius of the spheres, respectively. The analysis relies on the work of Rayleigh (1897) and Faran (1951) to provide the theoretical foundation for the acoustic scattering. Polystyrene spheres and disks provide the acoustic scattering in the laboratory while frazil ice (and whatever else might have been in suspension) provides the acoustic scattering in the field.

Polystyrene spheres and disks have different acoustic scatter properties – and both of these behave differently than frazil ice, which while small are largely disks. I don't think the Cryosphere audience needs 27 single spaced pages to compare and calibrate these scatters. Even the summary and conclusions are too verbose.

I would recommend a major revision focussed at the Cryosphere audience.

I have no specific comments given I believe the manuscript needs a major distillation for this journal's audience.

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