This manuscript describes a DAS experiment conducted on a frozen lake, with active airgun shots fired below the ice. In addition to the airgun-excited waves, two additional classes of events could be detected: (1) high-frequency waves that most likely originate from ice quakes caused by thermal expansion, and (2) a smaller number of low-frequency events that are excited by water waves and can be used to constrain the elastic properties of the ice.

The manuscript is logically structured and the data are certainly interesting. Nevertheless, there are several important issues that should be addressed prior to publication of the manuscript.

Thank you for your positive feedback on the logical structure of the manuscript and the interesting nature of the data. Your input has been instrumental in improving the quality and clarity of our work, and we appreciate your contribution to the refinement of our research. We sincerely hope that our responses and revisions adequately address all your concerns. Our responses to each comment are indicated below in blue.

LANGUAGE

My most important criticism is the unacceptable level of the English. While the meaning of most sentences can be guessed, part of the content can simply not be understood. This is absolutely not about correcting a few typos. Almost every single sentence should be corrected or rewritten.

Thank you. We have revised the manuscript in order to enhance the English expression while maintaining the original meaning.

BEYOND THE OBVIOUS

While the data are, as previously mentioned, interesting, it is unclear how they go beyond the obvious. Large numbers of quasi-randomly distributed ice quakes caused by diurnal thermal expansion are exactly what one would expect. The same holds for water-wave-induced events at lower frequency. That the latter can be used to constrain ice properties has been known at least since the 1950s. In summary, the authors should explain much more explicitly why this is science beyond the obvious that should be published in a journal like 'The Cryosphere'.

We appreciate the reviewer's comment and the opportunity to clarify the novelty and significance of our study. While it is true that large numbers of ice quakes caused by diurnal thermal expansion and water-wave-induced events are expected, our research goes beyond the obvious in the following aspects.

1. We investigate the potential of using Flexural-gravity wave to constrain ice properties, such as stiffness and thickness. While the concept of using water-wave-induced events for ice property estimation has been known for decades, the

observations of dispersion of flexural-gravity waves remain limited. Our study provides new insights by applying modern analysis techniques.

2. We utilize advanced techniques i.e., DAS observation and machine learning method, which allow for high-resolution monitoring and detection of seismic events on ice plate. This capability enables us to effectively identify internal fractures within the ice plate, a task that is often challenging for traditional methods.
3. We provide a comprehensive and detailed analysis of seismic events on ice plate, including their spatial distribution, temporal patterns, and waveforms. This analysis contributes to a better understanding of the behavior and characteristics of these icequakes and LFEs in our specific study area.
4. Our study demonstrates the applicability and effectiveness of DAS technology in studying icequakes and their relationship with water-wave-induced events.

In summary, our research expands upon the existing knowledge by providing a more detailed and comprehensive analysis of icequakes and water-wave-induced events. Furthermore, we highlight the potential applications of DAS technology and the relevance of water-wave-induced events in understanding ice properties. We believe that these findings make a valuable contribution to the scientific community, and we have revised the manuscript in the discussion section accordingly to emphasize the significance of our work beyond the obvious. We hope that these explanations address the reviewer's concerns and demonstrate the merit of our study for publication in 'The Cryosphere'.

BROADER IMPLICATIONS

Along similar lines, it is unclear what the broader implications of this work are. For example, what is the transferable insight that we gain? Why is this potentially more than just a study of one among very many ice sheets?

We appreciate the reviewer's comment and the opportunity to discuss the broader implications of our work. We would like to emphasize the following points:

1. Insights into ice properties and environmental interactions: Our study explores the relationship between water-wave-induced events and ice properties such as stiffness and thickness. This provides valuable information on the interaction between ice sheets and their surrounding environment. Understanding these interactions is crucial for accurately modeling ice sheet response to environmental changes and improving predictions of ice sheet stability. We determined a Young's modulus of approximately 9.1 for the ice plate, which is valuable for investigating the flexural stiffness of the ice plate.
2. Methodological advances: We utilize advanced techniques (DAS) and methods (machine learning) for monitoring and analyzing icequakes and water-wave-induced events. Our research demonstrates the applicability and effectiveness of these methods in studying ice sheet dynamics and properties. This contributes to

the advancement of monitoring and analysis techniques in glaciology and seismology, with potential applications in other regions, such as ice shelves.

In summary, our study offers insights into the behavior of ice plate, the interaction between ice and its environment, and methodological advancements in monitoring and analysis. These findings have broader implications for improving our understanding of ice plate dynamics, informing climate change mitigation and adaptation strategies, and advancing monitoring techniques.

We have revised the manuscript to explicitly discuss these broader implications and highlight the transferable insights gained from our work. The modifications are in Discussion section.

COMPARISON

One of the authors' major conclusions is that DAS offers new opportunities that conventional instruments may not offer. However, this claim is not at all supported. The authors compare to the recordings of an on-shore seismometer, which is not only further away from the ice quakes than the DAS array but also naturally records lower amplitudes than instruments on the floating ice sheet. (For example, much of the energy will not even make it from the fluid into the solid.) Hence, the authors' claim really rests on an unfair comparison of apples and oranges.

Thank you for pointing this out. We agree that this is not fair and meaningless. In this work, we focus on the study of the microseismic events and physical property of the ice plate. Considering this, we deleted this part.