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Properties of the bed of Thwaites Glacier, West Antarctica, estimated from vibroseismic surveys (2022-23 and 2023-24)

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In the Antarctic field seasons 2022/23 and 2023/24 the GHOST team (Geophysical Habitat of Subglacial Thwaites: <https://thwaitesglacier.org/projects/ghost>) as part of the International Thwaites Glacier Collaboration (ITGC), collected several hundred kilometers of multi-fold seismic reflection profile of Thwaites Glacier. The data cover the center flow line (first season) and across flow profiles (second season), starting 60 km upstream from the grounding line. The seismic profiling set-up consisted of a seismic vibrator source and 60 geophones on a 1.5 km long cable, all towed by a tracked vehicle. The combination of surface seismic source and towed geophone array allows for rapid and high quality data acquisition. The seismic signal penetrates approximately 200 meters into the bed with deeper structures imaged in places. The along-flow profile revealed a repeating of bedforms alternating between relatively flat and smooth regions a few km long, and regions of more pronounced topography of 10s to 100s of meter high bumps. In addition we imaged what we interpret as sediment filled basins. Comparison with high-resolution ground-based swath radar allows the identification of geomorphological bedforms, such as megascale glacial lineations, sediment-filled basins and troughs, which can then be directly identified in the seismograms. We present a first preliminary evaluation of the subglacial characteristics and discuss the potential relevance of the subglacial boundary condition for ice flow dynamics.

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