Depth dependence of acoustic signals produced by bubble release events in melting glacier ice

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ABSTRACT

Melting glaciers and ice sheets are important contributors to sea level rise, but the rates at which they are losing mass are difficult to measure precisely. Using the acoustic signals produced by the rapid release of pressurized air from bubbles contained in the ice is a promising avenue for obtaining quantitative estimates of the rate of submarine melting at the termini of tidewater glaciers. The amplitude and character of the observed average signal generated by the bubble release events have been found to depend strongly upon the hydrostatic pressure of the water the bubbles are released into, and therefore on the depth at which said events occur; this dependence must be better understood before the goal of measuring melting rates can be achieved. Data from field experiments performed at the Hornsund fjord in Svalbard, Norway, in which the acoustic melting signal from blocks of glacier ice was recorded at varying depths, will be presented, and compared to the output of an idealized model for the acoustic signal produced by the release of bubbles from melting ice.