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Ultrasonic velocity logging of cores from Glacier de Tsanfleuron, Switzerland

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The purpose of the study was to compare the velocities of ultrasonic waves through temperate ice, to determine the relationship between wave velocity and wavelength and to study the anisotropy of temperate ice from temperate glacial ice. Cores with a maximum depth of 43m were used. P wave velocities were measured parallel and perpendicular to the vertical axis of the ice cores. Two frequencies, 200 kHz and 54 kHz were used, equating to wavelengths of approximately 17mm and 76mm respectively. The results showed that wavelength is proportional to velocity. 200 kHz waves averaged 3455 ms^{-1}, and 54 kHz waves averaged 4106ms^{-1}. 200 kHz waves were slower than the velocities in observed polar cores whilst 54 kHz waves were slightly faster. The 54 kHz waves also had a lower standard deviation than 200 kHz waves, due to less wave deviation along alternative pathways than higher frequency waves. Standard deviation also reduces with increase in crystal size. The ice was not characterised by a strong anisotropy which was to be expected taking into account existing c axis orientation for the cores. Unexpectedly waves travelling parallel to the vertical axis of the core were slower than the waves travelling perpendicular to it. This may be due to water held in the core freezing whilst in storage with c axis perpendicular to the vertical axis of the core. The findings of this study will be valuable in the development of a strategy for the use of seismic surveying techniques in the determination of ice fabric in temperate ice masses.