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**Effects of Infauna on Sound Speed and Attenuation in Marine Sediments**

Infauna alter the physical properties of marine sediments in many ways. Compact mud burrows, tubes built from shell hash, large subsurface galleries, and local changes in porosity are a few examples of these alterations. Structural changes such as these may be detectable non-invasively through their effects on the acoustic properties of sediment. Here, we investigate how infauna may affect the sound speed and attenuation in sediments using laboratory mesocosm experiments with controlled manipulations. These manipulations are intended to mimic how potentially important functional groups of infauna affect sediment structure while minimizing the variability inherent in working with live animals. In both manipulated and control mesocosms, sound speed and attenuation were measured at multiple depths and at high frequencies (100-400 kHz) with wavelengths (~15 mm) corresponding to the scales of expected impacts of individual infaunal organisms. Manipulations include construction of tubes from shell hash to mimic *Owienia* polychaete tubes, burrowing via excavation and compaction, and sediment irrigation. Physical obstructions, like a shelly tube, were the most easily detectable manipulations, although irrigation and burrowing were still detected at higher frequencies.