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Thermal Expansion of Single-Crystalline H_2O and D_2O Ice[1] JOHN J. NEUMEIER, DAVID T. W. BUCKINGHAM, Montana State University, YI-KUO YU, National Center for Biotechnology Information — Thermal expansion of single-crystalline H_2O and D_2O ice I*h* with relative resolution of one part in one billion is reported. The measurements were conducted using a thermal expansion cell constructed entirely from fused silica (amorphous quartz), which has an extremely small thermal expansion coefficient. Single crystals were grown using a zone-refining method in a chest freezer purchased from Costco. The crystal growth and measurement methods will be discussed. The measurements reveal a large transition in the thermal expansion coefficient at 101 K in H_2O, which moves to 125 K in D_2O. It is one of the largest-known isotope effects. Rotational oscillatory modes that couple poorly to phonons appear to be responsible. These types of vibrations are classical in nature, and often called lattice solitons or "intrinsic localized modes".

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