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Anomalous Temperature Dependence and Isotope Effect in the Structural Dynamics of Deeply Supercooled Water ALEXANDER L. AGAPOV, University of Tennessee, Knoxville, TN, ALEXANDER I. KOLESNIKOV, Oak Ridge National Laboratory, Oak Ridge, TN, VLADIMIR N. NOVIKOV, University of Tennessee, Knoxville, TN, RANKO RICHERT, Arizona State University, Tempe, AZ, ALEXEI P. SOKOLOV, University of Tennessee, Knoxville, TN — Despite simple chemical structure and its importance in our life, water remains one of the most puzzling liquids.[1] Combining neutron scattering and dielectric spectroscopy we show that quantum fluctuations have a pronounced effect on dynamics in deeply supercooled water. Dielectric measurements revealed that water has an anomalously weak temperature dependence of structural dynamics close to $T_g \approx 136$K with unphysical low fragility index $m \approx 14$. Additionally, we observed an anomalously large isotope shift of T_g between H_2O and D_2O, $\Delta T_g \sim$ 8-10K, in a strong contrast to the isotope effect on T_g observed in other hydrogen bonding liquids. The observed anomalous behavior is consistent with the recently suggested idea of quantum zero-point vibrations affecting dynamics of supercooled water.[2] We speculate that the apparent fragile-to-strong crossover in dynamics of water can be ascribed to quantum effects dominating structural relaxation at low temperatures. These results have significant implications for our understanding of water dynamics and its peculiar behavior at low temperatures.

[1]Angell, C. A. *Science* 319, 582-587 (2008).
[2]Novikov, V. N. & Sokolov, A. P. *Phys. Rev. Lett.* 110, 065701 (2013).

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