LIQUID WATER: A STATE BETWEEN TWO CRITICAL POINTS

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Liquid water is still a puzzle. Unlike ordinary substances, one can view water near the triple point and in the supercooled region, on the one side, and water near the vapor-liquid critical point, on the other side, as "the same substance – two different liquids". Highly-compressible, low-dielectric-constant near-critical water is commonly used as a supercritical-fluid solvent. On the low-temperature side of the phase diagram, water is an almost incompressible, high-dielectric constant solvent with some mysterious properties. In this region, some of the puzzles of liquid water can be explained by the existence of the liquid-liquid critical point in metastable supercooled region. Therefore, supercooled liquid water can be also regarded as a specific weakly compressible "supercritical fluid". Fluctuations of entropy, diverging at the liquid-liquid critical point, may be associated with anomalous sensitivity ("susceptibility") of water structure to external perturbations and may also be responsible for mysterious behavior of some aqueous solutions. In particular, even with hardly detectable traces of an impurity, aqueous solutions cannot be regarded as "dilute". By stabilizing the fluctuations of water structure, through self-assembly of small organic molecules in aqueous solutions, one can create novel nano particles and mesophases.