

## 1. Density anomaly in a waterlike model confined between plates

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*Water exhibits thermodynamic, dynamic and structural anomalous properties when compared with other substances. While most liquids contract upon cooling, water expands below  $T = 4^{\circ}\text{C}$  at ambient pressure, which characterize the density anomaly. Recently, confined water has been receiving a lot of attention due to its applications in industrial and biological systems. In this work, we explore the effects of confinement in the pressure-temperature phase diagram of liquid water confined between plates. We employ molecular dynamic simulations in the NVT ensemble to study the systems. Water is modeled by a two length scale effective potential in which the particle-particle interaction has a repulsive shoulder at  $r/\sigma_p \approx 1$  and a very small attractive part around  $r\sigma_p \approx 3.8$ . In  $z$  direction, the particles are confined between two flat, rough and neutral plates, and the particle-plate interaction is given by a Weeks-Chandler-Andersen potential (WCA). We found that this system exhibits layering density in  $z$  direction and that the number of layers depends on the distance  $d/\sigma_p$  between the plates. The pressure-temperature phase diagram of the confined system shows the presence of density, diffusion and structural anomalous behavior similar to the behavior observed in bulk water, but for lower temperatures and higher densities.*