Thermal-pressure-driven gas flows through micro channels

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Abstract
In this paper we study mass flow rate of rarefied gas flow through micro/nanoscale channels under simultaneous thermal and pressure gradients using an improved direct simulation Monte Carlo (DSMC) method. Before targeting thermal/pressure driven flows, we first analyze pressure-driven flows and verify our DSMC solver. Next, we study micro-/nanochannels flows under simultaneous pressure-temperature gradients while our main objective is to predict mass flow rate increment due to thermal creep effects. The effects of thermal creep are studied over a wide range of flow rarefaction from the slip to free molecular regime. Our results showed that the non-dimensional thermal creep mass flow rate increments of the Poiseuille flow increases and approaches the value of 0.578 at free molecular limit.