On the role of surface shape in a micro-scale heat conduction problem

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Abstract.
The present study investigates the importance of the surface shape in a micro-scale heat conduction problem. A heated infinitely-thin cylindrical shell is positioned in the middle of two concentric cylinders, and the heat transfer through a rarefied gas between the shell and the confining inner (or outer) cylinder is investigated. The study initially considers the solution of the first- and second-order temperature-jump models (*i.e.* the conventional heat equation with temperature-jump boundary conditions). The study then examines the numerical solution of the nonlinear Shakhov model kinetic equation subject to the Maxwell boundary condition using the discrete velocity method (DVM). The variable-hard-sphere molecular interaction model is taken into account in the temperature-jump models allowing the presence of significant temperature differences between surfaces to be considered. Anomalous temperature profiles near the convex (or concave) side of the shell are attributed to the effects of surface shape.