Abstract Submitted
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A quadrature-based kinetic model for a dilute non-isothermal granular gas[1] ALBERTO PASSALACQUA, Iowa State University, JANINE GALVIN, US-DOE NETL, PRAKASH VEDULA, University of Oklahoma, CHRISTINE HRENYA, University of Colorado, RODNEY FOX, Iowa State University — A dilute non-isothermal inelastic granular gas between two stationary Maxwellian walls is studied by means of numerical simulations of the Boltzmann kinetic equation with hard-sphere collisions. The behavior of a granular gas in these conditions is influenced by the thickness of the wall Knudsen layer: if its thickness is not negligible, the traditional description based on the Navier-Stokes-Fourier equations is invalid, and it is necessary to account for the presence of rarefaction effects using high-order solutions of the Boltzmann equation. The system is described by solving the full Boltzmann equation using a quadrature-based moment method (QMOM), with different orders of accuracy in terms of the moments of the distribution function, considering moments up to the seventh order. Four different inelastic collision models (BGK, ES-BGK, Maxwell hard-sphere, Boltzmann hard-sphere) are employed. QMOM results are compared with the predictions of molecular dynamics (MD) simulations of a nearly equivalent system with finite-size particles, showing the agreement of constitutive quantities such as heat flux and stress tensor.

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