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Quadrature–based moment closures for non–equilibrium flows: hard–spheres collisions and approach to equilibrium MATTEO ICARDI, PIETRO ASINARI, DANIELE MARCHISIO, Politecnico di Torino, SALVADOR IZQUIERDO, Instituto Tecnológico de Aragón and Universidad de Zaragoza, RODNEY FOX, Iowa State University — Recently the Quadrature Method of Moments (QMOM) has been extended to solve several kinetic equations, in particular for gas–particle flows and rarefied gases. This method is usually coupled with simplified linear models for particle collisions. In this work QMOM is tested as a closure for the dynamics of high–order moments with a more realistic collision model namely the hard–spheres model in the Homogeneous Isotropic Boltzmann Equation. The behavior of QMOM far away and approaching the equilibrium is studied. Results are compared to other techniques such as the Lattice–Boltzmann (LBM) and the Grad's expansion (GM) methods. Comparison with a more accurate and computationally expensive model, based on the Discrete Velocity Method (DVM), is also carried out. Our results show that QMOM describes very well the evolution when it is far away from equilibrium, without the drawbacks of the GM and LBM or the computational costs of DVM but it is not able to accurately reproduce the equilibrium and the dynamics close to it. Corrections to cure this behavior are proposed and tested.

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