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Predictive Capabilities of a Relaxation Model for Parcel-Based Granular Flow Simulations[1] STEFAN RADL, SANKARAN SUNDARESAN, Department of Chemical and Biological Engineering, Princeton University — Parcel-based methods have a great potential to reduce the computational cost of particle simulations for dense flows. Here we investigate a relaxation model, similar to that of Bhatnagar-Gross-Krook (BGK), when applied to such a parcel-based simulation method. Specifically, we have chosen the simulation methodology initially proposed by Patankar and Joseph [1], and combined it with the relaxation model published by O'Rourke and Snider [2]. We show that a relaxation model is key to correctly predicting macroscopic flow features, e.g., the scattering pattern of a granular jet impinging on a flat surface, studied experimentally by Cheng et al. [3]. Simple shear flow simulations reveal that calculation of the locally-averaged velocity is a critical ingredient to correctly predict streaming and collisional stresses.

[1] N.A. Patankar, and D.D. Joseph, Int. J. Multiphase Flow 27, 1659 (2001).
[2] P.J. O'Rourke, and D.M. Snider, Chem. Eng. Sci. 65, 6014 (2010).
[3] X. Cheng et al., Phys. Rev. Lett. 99, 188001 (2007).

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Stefan Radl
Department of Chemical and Biological Engineering, Princeton University

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