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The Liquid-solid Transition of Two Dimensional Hard Spheres Under Gravity Using a Global Equation of State PAUL QUINN, DANIEL SNYDER, Kutztown University of PA — In a previous paper, Hong started with the Enskog equation of hard spheres of mass m and diameter D under gravity and derived an exact equation of motion for an equilibrium density profile at a temperature T . [D.C. Hong, *Physica A*, 271, 192 (1999)] This leads to a transition between the liquid and solid regimes of the granular system that is temperature dependent. In this derivation, Hong used the Ree and Hoover correlation function, which is typically for lower density systems, to obtain his results. In a previous paper, Luding obtained a global equation of state for hard spheres in two dimensions that is valid over the entire range of densities of a granular system. [Luding, *Physical Review E*, 63, (2001)] Using this new global equation of state as well as the ideas expressed by Hong, we obtain a more exact equation of motion for an equilibrium density profile at a temperature T in two dimensions. We then explore this new equation and find that it further supports the condensation theory as presented previously by Hong.

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