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Yuxi Zheng* (yzheng@math.psu.edu), Department of Mathematics, Penn State University, University Park, PA 16802, and **Zachary Robinson**. *The Pressure Gradient System*.

The pressure gradient system is a sub-system of the compressible Euler system. It can be obtained either through a flux splitting or an asymptotic expansion. In both derivations, the velocity field is treated as a small remnant of the original velocity of the Euler system. As such, the boundary conditions for the velocity do not necessarily follow the original ones and careful consideration is needed for the validity, integrity, and completeness of the model. We provide numerical simulations as well as basic characteristic analysis and physical considerations for the Riemann problems of the model to find out appropriate internal conditions at the origin. The study reveals subtle structures of the velocity. The numerics is done at higher resolutions than traditionally possible via the automated clawpack that contains adaptive mesh refinement (AMR) and message passing interface (MPI), for which we provide the Riemann solvers, where the Roe's approximation has the elegant $1/2$ average in the model's original variables. (Received August 28, 2009)