Inelastic Interaction and Non-Traveling-Wave Effects for Two Multi-Dimensional Burgers Models from Fluid Dynamics and Astrophysics with Symbolic Computation

Tao Xu\textsuperscript{a}, Chun-Yi Zhang\textsuperscript{b,c}, Juan Li\textsuperscript{a}, Hai-Qiang Zhang\textsuperscript{a}, Li-Li Li\textsuperscript{a}, and Bo Tian\textsuperscript{a}

\textsuperscript{a} School of Science, Beijing University of Posts and Telecommunications, P. O. Box 122, Beijing 100876, China
\textsuperscript{b} Meteorology Center of Air Force Command Post, Changchun 130051, China
\textsuperscript{c} Ministry-of-Education Key Laboratory of Fluid Mechanics and National Laboratory for Computational Fluid Dynamics, Beijing University of Aeronautics and Astronautics, Beijing 100083, China

Reprint requests to T. X.; E-mail: xutodd@ss.buaa.edu.cn

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Describing the surface perturbations of a shallow viscous fluid, cosmic-ray-modified shock structures and electromagnetic waves in a saturated ferrite, the (2+1)- and (3+1)-dimensional Burgers equations are investigated in this paper. In view of the higher space dimensionality, the transformations from such two models to a (1+1)-dimensional Burgers equation are constructed with symbolic computation. Via the obtained transformations, three families of multi-dimensional \textit{N}-shock-wave-like solutions are specially presented, which recover some previously published solutions. The inelastically interacting properties and some non-traveling-wave effects of shock waves are discussed through the figures for several sample solutions. Additionally, possible applications for those solutions and effects in some fields are also pointed out.

\textit{Key words:} Multi-Dimensional Burgers Equations; Inelastic Interaction; Non-Traveling-Wave Effects; \textit{N}-Shock-Wave-Like Solutions; Symbolic Computation.