

Accepted Manuscript

Element centered smooth artificial viscosity in discontinuous Galerkin method for propagation of acoustic shock waves on unstructured meshes

Bharat B. Tripathi, Adrian Luca, Sambandam Baskar, François Coulouvrat, Régis Marchiano

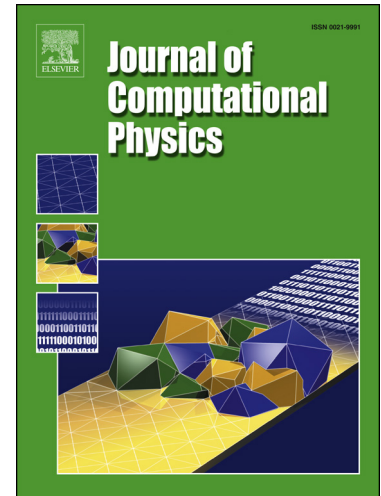
PII: S0021-9991(18)30224-9
DOI: <https://doi.org/10.1016/j.jcp.2018.04.010>
Reference: YJCPH 7949

To appear in: *Journal of Computational Physics*

Received date: 2 October 2017
Revised date: 20 March 2018
Accepted date: 4 April 2018

Please cite this article in press as: B.B. Tripathi et al., Element centered smooth artificial viscosity in discontinuous Galerkin method for propagation of acoustic shock waves on unstructured meshes, *J. Comput. Phys.* (2018), <https://doi.org/10.1016/j.jcp.2018.04.010>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



1 Element Centered Smooth Artificial Viscosity in
 2 Discontinuous Galerkin Method for Propagation of
 3 Acoustic Shock Waves on Unstructured Meshes

4 Bharat B. Tripathi^a, Adrian Luca^a, Sambandam Baskar^b, François
 5 Coulouvrat^a, Régis Marchiano^a

6 ^a*Sorbonne Universités, UPMC Univ Paris 06, CNRS, UMR 7190, Institut Jean Le Rond*
 7 *d'Alembert, 4 place Jussieu, 75252 Paris, France*

8 ^b*Department of Mathematics, Indian Institute of Technology Bombay,*
 9 *Powai, Mumbai 400076, India.*

10 **Abstract**

This work aims at developing a high-order numerical method for the propagation of acoustic shock waves using the discontinuous Galerkin method. High order methods tend to amplify the formation of spurious oscillations (Gibbs phenomenon) around the discontinuities/shocks, associated to the relative importance of higher-harmonics resulting from nonlinear propagation (in our case). To handle this critical issue, a new shock sensor is introduced for the sub-cell shock capturing. Thereafter, an *element-centered smooth artificial viscosity* is introduced into the system wherever an acoustic shock wave is sensed. Validation tests in 1D and 2D configurations show that the method is well-suited for the propagation of acoustic shock waves along with other physical effects like geometrical spreading and diffraction.

11 *Keywords:* Discontinuous Galerkin, Shock capturing, Artificial viscosity,
 12 Nonlinear acoustics

13 **1. Introduction**

14 One of the most spectacular features of nonlinear acoustics is the genera-
 15 tion of shock waves along the propagation. In this case, the speed c of finite
 16 amplitude sound waves is not strictly constant, even in homogeneous fluids. It
 17 is dependent on the wave instantaneous pressure amplitude p_a . At first order,

Download English Version:

<https://daneshyari.com/en/article/6928833>

Download Persian Version:

<https://daneshyari.com/article/6928833>

[Daneshyari.com](https://daneshyari.com)