Response to Reviewers

June 26, 2017

1) p.3. "see Godunov and Romenski [13]". In this reference, the authors proposed a model in which the tensor G=A'*A is used instead of the distortion matrix A, however, the general idea is the same. So, I suggest to add references to the Russian book by Godunov 1978 "Elements of continuum mechanics and conservation laws" and to its Englsih translation, Godunov & Romenskii 2003 where exactly the same equation utilizing the distortion matrix were studied for elastoplastic deformation in metals.

The reference has been changed to Godunov & Romenskii 2003 (page 3).

2) p.5, paragraph on the top of the page. So, roughly speaking, the model discussed in Godunov1978 and Godunov&Romenskii2003 is the same as in Dumbser et al [7] and the interpretation of the distortion matrix are the same too, it is a field that describes only local deformation of the material elements (fluid parcels). The main contribution of the Peshkov&Romesnki [21] is that they dared to propose that these equations can be used to model fluids. Please correct this paragraph.

This has been corrected (page 5).

3) eq. (39a), please write indices on the right-hand side or remove them on the left.

The indices have been removed. They have also been removed from eq. (39b) for consistency (page 9).

4) Somewhere in the introduction, it is better to mention that the EOS for the GPR model studied in Dumbser et al [7] is just a particular choice while many others can be used.

This has been noted in the text (page 3).

5) the notations in eq. (41) look not good. It is better to remind the reader that E_{2A} and E_{2J} are the partial derivatives of E_2 with respect to A and J

Sorry for the confusion, these are actually mean to be the components of E_2 that depend only on A and $\boldsymbol{J}$, respectively. I have introduced a slightly different notation to avoid this confusion, and have clarified its use in the text (pages 9, 10).

6) What do the three dots in eq. (44) mean?

This notation means "therefore". Sorry, I thought it was standardized. I have now removed it (page 10).

7) in eq. (53), the notation \bar{x} is not specified. I guess it is \bar{x}=(1/3)*(x1+x2+x3)

You are correct. I have clarified this in the paper (page 11).

8) In eq. (54), remove c, it is 1 instead.

This has been done (page 11).

9) eq. (71), three dots again. I am not familiar with this notation. Please clarify for readers like me.

I have removed the notation (page 14).

10) In all the numerical examples, in the text, please write also the values of \tau_1 and \tau_2. Even if they are obtained from (10a) and (10b) it is better to give their numerical values.

This has been done (pages 16, 18, 20, 23).

11) It seems that the accuracy of the ADER-WENO scheme used in the paper is 2. Please write this explicitly.

The order of accuracy of the ADER-WENO method used here is actually 3 (corresponding to reconstruction polynomials of degree $N = 2$). This has been made explicit in section 1.3 "The ADER-WENO Method" (page 5).

12) What N=2 does mean in the caption to Fig.5.

This is the order of the reconstruction polynomials used in the WENO reconstructions. This has now been made explicit in the description of each numerical test (pages 18, 20, 23).

13) In Table 3, when you compare the performance of the methods, I believe, readers would also like to see the number of time steps taken by both methods.

A new table has been added with this information (page 23).

14) In fact, I am surprised to see that the standard operator splitting works for stiff hyperbolic PDEs, see for example the discussion in Dumbser, Enaux, Toro, 2008 "Finite Volume Schemes of Very High Order of Accuracy for Stiff Hyperbolic Balance Laws". Or the examples studied are not stiff? The stiffness might be understood as \tau/T << 1 where T is a characteristic time scale of the flow and \tau is the relaxation time. A short discussion of why the method based on the operator splitting works in stiff regime should be added somewhere.

Two of the tests in this study can be considered to be stiff. Similarly to the results in Leveque & Yee, "A Study of Numerical Methods for Hyperbolic Conservation Laws with Stiff Source Terms", the new method presented in this study is second-order accurate and stable, but may face difficulties on specific types of problems. These issues and others are now addressed in the conclusion (page 24).

15) Please start the conclusion section with the repeating of the model solved, list distinguished features of the new method, etc.

This has been done (page 24).

Additional Notes

I have changed the convergence test used, from the Viscous Shock Test to the Advected Isentropic Vortex Test (section 4.6, pages 20-24). This allows comparability with Dumbser et al. 2016.