

Geosci. Model Dev. Discuss., referee comment RC2  
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## **Comment on gmd-2021-200**

Quoc Anh Tran (Referee)

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Referee comment on "An explicit GPU-based material point method solver for elastoplastic problems (ep2-3De v1.0)" by Emmanuel Wyser et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-200-RC2>, 2021

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This paper demonstrates the numerical implementation of the explicit material point method using GPU for parallel computing. In Reviewer opinion, the paper is of interest for the Readers of Geoscientific Model Development. However, a number of issues need to be addressed before the paper can be accepted for publication.

- The paper is currently long and several part can be replaced by references. For example, the MPM algorithm is derived from forward-Euler scheme with update stress lasso, GIMP basis functions in appendix A.
  
- There are several methods dealing with the volumetric locking in the literature. However, the author proposed the volumetric locking by averaging only the volumetric part of the stress tensor. The author is suggested to clarify the decision for that. Furthermore, volumetric locking can smooth out the value of the stress. It is better if the stress is plotted in the numerical examples to see the difference between simulations with and without volumetric locking.

- Section 4 mentions that Model 1b demonstrates the influence of mesh resolution but I do not see it in Model1b. The author is suggested to perform convergence rate analysis in different mesh size in the plane strain to highlight the influence of the mesh resolution.
  
- For Model 1b, the presented final geometry of the experiment is shorter to the one in Bui et al. (2008) experiment (see Figure 6) in my opinion. Please check. Therefore, it is not necessary to introduce the damping.
  
- In Model 2, there is a boundary effect on the failure mechanism as the shear band can touch the bottom boundary. It would be better if there is a larger depth in the bottom direction. And, the Model 2 introduces local damping which in my opinion it is not necessary.