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P5.2009 Hydrodynamic simulations of laser/plasma interactions via ALE methods

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Hydrodynamic simulations of laser-produced plasmas represent a useful tool both for theoreticians and experimentalists allowing them to investigate processes during laser-plasma interaction, which are often impossible to observe directly during the experiments. They allow not only interpretation of experimental results, but are also often used for designing of the experimental setup or detailed analysis of particular processes during the experiment.
Here, we are mainly interested in the application of the Arbitrary Lagrangian-Eulerian (ALE) numerical methods, benefiting from the computational mesh moving with the fluid in a Lagrangian manner, while enforcing its geometric quality by a regular mesh smoothing mechanism. This type of methods is very convenient for simulations of laser/target simulations and is relatively simply extendable for additional physical models needed for suitable results, such as realistic equations of state [1], absorption of laser beam [2], heat conductivity model [3], cylindrical geometry, two-temperature model, phase transition model, etc.
The described models have been implemented in the framework of PALE (Prague ALE) hydrodynamic code, allowing a large range of hydrodynamic simulations related to laser/target interactions, see [4] for several examples. Here, the performance of the code is verified on selected realistic numerical tests.

References
[1] M. Zeman, M. Holec, and P. Vachal. HerEOS: A framework for consistent treatment of the equation of state in ALE hydrodynamics. Computers & Mathematics with Applications, 2019. In press.
[2] J. Nikl, M. Kucharik, J. Limpouch, R. Liska, and S. Weber. Wave-based laser absorption method for high-order transport-hydrodynamic codes. Advances in Computational Mathematics, 2019. In press.
[3] R. Liska and M. Kucharik. Arbitrary Lagrangian Eulerian method for compressible plasma simulations. In M. Fila, A. Handlovicova, K. Mikula, M. Medved, P. Quittner, and D. Sevcovic, editors, Proceedings of EQUADIFF 11, International Conference on Differential Equations, pages 213222. STU, 2007. ISBN 97880-227-2624-5.
[4] R. Liska, M. Kucharik, J. Limpouch, O. Renner, P. Vachal, L. Bednarik, and J. Velechovsky. ALE methods for simulations of laser-produced plasmas. In Jaroslav Fort, Jirí Fürst, Jan Halama, Raphaèl Herbin, and Florence Hubert, editors, Finite Volumes for Complex Applications VI Problems & Perspectives, volume 4 of Springer Proceedings in Mathematics, pages 857873. Springer, 2011.

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