

# Modeling of laser-induced residual stresses with smoothed particle hydrodynamics

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There have been numerous studies on laser ablation using ultrashort pulses, but none of these works employs an elastic-plastic model. In this study, we explore the laser-induced residual stresses using the Johnson-Cook elastic-plastic model.

The modelling is done using the Godunov-like (contact) smoothed particle hydrodynamics (SPH) method, as described in [1]. The models are formulated in both 1D and axisymmetrical 2D formulations.

A recently developed axisymmetrical contact SPH solver employs a MUSCL-type interparticle reconstruction. To enhance accuracy, a kernel gradient correction is incorporated into this scheme, similar to what has been done in [2, 3].

This scheme has been tested on various tests and is found to be a suitable choice for modelling laser-induced residual stresses.

- [1] Parshikov A N and Medin S A 2002 *Journal of Computational Physics* **180** 358–382
- [2] Rublev G, Parshikov A and Dyachkov S 2025 *Applied Mathematics and Computation* **488** 129128
- [3] Rublev G and Murzov S A 2025 *VANT, Mathematical modeling of physical processes*