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Variable High-Order Shock Capturing with GP-WENO in the FLASH Code[1] ADAM REYES, University of Chicago, DONGWOOK LEE, University of California Santa Cruz, CARLO GRAZIANI, Argonne National Laboratory, PETROS TZEFERACOS, University of Chicago — We present an implementation of a shock-capturing scheme for hyperbolic equations. The method attains high-order of accuracy by using kernel-based Gaussian process (GP) data prediction for the reconstruction of Riemann states in a finite volume framework. To handle shocks and discontinuities the method adopts a strategy similar to the weighted essentially non-oscillatory (WENO) schemes. In GP-WENO the GP prediction takes place of the polynomial interpolation and the conventional L_2 type WENO smoothness indicators are replaced with the Gaussian likelihood derived from the underlying GP model. The new GP smoothness indicators provide significant improvements in delivering a selectable high-order accuracy in smooth flows, while giving non-oscillatory solutions in discontinuous flows. We benchmark GP-WENO on a suite of test problems using an implementation in the FLASH code. This addition promises a significant enhancement to the codes fidelity in modeling laser-driven plasma experiments.

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