Multifluid dust Hydrodynamics on GPUs

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We present a new solver based on matrix exponential for the momemtum exchange between the gas and an arbitrary number of dust species. The computation of the matrix exponential is done by a Taylor-based scaling and squaring method. The solver is implemented in Shamrock and in Dyablo, both are multi-GPUs codes. For comparison, we also implement existing state-of-the-art drag solvers. The first hydrodynamic series of tests (dusty collision, damped sound waves, dusty shocks), demonstrate the robustness and the accuracy of our solver.