High-order discontinuous Galerkin scheme for the coagulation/fragmentation equation

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Résumé

Particles coagulation and fragmentation are ubiquitous (raindrop formation, air pollution, combustion, polymerisation, astrophysics) and mathematically described by the Smoluchowski coagulation and the fragmentation equations. Solving these equation accurately while preserving tractable computational costs is a tremendous numerical challenge, yet critical for understanding the formation of the planets. In particular, low-order schemes do strongly overestimate the formation of large particles. We present a novel high-order discontinuous Galerkin algorithm (Lombart and Laibe 2021) that addresses all these issues. The algorithm is designed in a modular way to be coupled in other codes. In particular, we aim to perform the first 3D simulations of dusty protoplanetary discs that include realistic coagulation/fragmentation.

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