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Dust dynamics during the protostellar collapse

Interstellar dust grains, about one percent of the mass of the diffuse interstellar medium, strongly affect star formation. In particular, the local distribution, from small grains to the larger ones, play various roles during the protostellar sequence, from the thermodynamics and the chemistry of molecular clouds, to the opacity of collapsing protostellar cores and the coupling between the gas and the magnetic field, down to planet formation in young and evolved disks around protostars.
We have implemented a dust multifluid module to treat a distribution of neutral grains in the RAMSES code. This allow us to simulate protostellar collapses for a large dynamical range while controlling the initial grain size distribution and initial level of turbulence, two parameters that impacts the dust enrichment in the first hydrostatic core and in the protostellar envelope (Verrier et al, in prep). In this paper, we present a novel numerical method informed by the wave physics in a gas and dust mixture.

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