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Modelling Radiation Hydrodynamics with the Variable-Eddington Tensor Method in the FLASH AMR Code

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The transport of radiation and its dynamical interaction with dusty gas is important for a wide range of applications —from the interior of stars, to kilo-parsec flows onto active galactic nuclei. Modelling these systems requires a self-consistent and accurate treatment of the radiation transport. In this talk, I will present a new time-dependent Radiation-Hydrodynamical (RHD) module with support for Adaptive Mesh Refinement (AMR) in the FLASH magnetohydrodynamics (MHD) code. I will discuss general difficulties associated with modelling RHD, and various approximations induced to alleviate the complex angular dependencies of radiation transport. Our new method uses the Variable Eddington Tensor (VET) closure approach for modelling the directionality of the radiation flow, based on a ray-tracing step to estimate the Eddington Tensor. I will present standard numerical tests of the algorithm, compare the VET approach with other commonly used methods such as the Flux-Limited-Diffusion and Moment-1 approximations, and discuss applications in star formation and the interstellar medium.

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