Multigroups radiation hydrodynamics

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We will present a multigroup model for radiation hydrodynamics which is capable of accounting for variations of the gas opacity as a function of frequency. The frequency domain has been divided into groups inside each of which a moment method has been applied. Previously unaccounted frequency dependent coupling terms between matter and radiation were conserved in order to describe energy exchanges between neighbouring frequency groups due to Doppler effects when strong velocity gradients are present in the gas flow. These terms were computed using a finite volume method in the frequency domain. The radiative transfer aspect of the method was first tested separately for global consistency (reversion to a grey model) and against a well established kinetic model through Marshak wave tests with frequency dependent opacities. Very good agreement between the multigroup M_{1} and kinetic models was observed in all tests. The successful coupling of the multigroup radiative transfer to the hydrodynamics was then confirmed through a second series of tests. Finally, the model was linked to a database of opacities for a Xe gas in order to simulate realistic multigroup radiative shocks in Xe. The differences with the previous grey models will be discussed.