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High-resolution schemes with polynomial viscosity matrices for multi-species kinematic flow models^{*}

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Abstract

In this work, we present a class of fast first order finite volume solvers, called PVM (polynomial viscosity matrix), for conservative hyperbolic systems. They are defined in terms of viscosity matrices computed by a suitable polynomial evaluation of a Roe matrix. These methods have the advantage that they only need some information about the eigenvalues of the system to be defined, and no spectral decomposition of a Roe matrix is needed. As a consequence, they are faster than the Roe method. On the other hand, because we propose to use a first order finite volume solvers, we analyze the use of high-order reconstruction method WENO and MUSCL [3], each of these used for the reconstruction of ows and states respectively, for obtain as result a high-resolution schemes with polynomial viscosity matrices economic in the sense of PVM methods [4]. The numerical tests presented here, the performances of the numerical schemes and compared with each others is performed for multi-species kinematic ow models. These models have been studied for example in [1] and [2].

Key words: PVM, Multi-Species Kinematic Flow Models, WENO, MUSCL. Mathematics subject classifications (1991): 665N30, 65N38, 76D07, 76M10, 76M15

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