Modified Patankar-Runge-Kutta Schemes for Conservative Production-Destruction Equations

Andreas Meister (Institut für Mathematik, Universität Kassel), Stefan Kopecz

Modified Patankar-Runge-Kutta (MPRK) schemes are numerical methods for the solution of positive and conservative production-destruction systems. They adapt explicit Runge-Kutta schemes in a way to ensure positivity and conservation irrespective of the time step size. With the talk we introduce a general definition of MPRK schemes and present a thorough investigation of necessary as well as sufficient conditions to derive first, second and third order accurate MPRK schemes. The theoretical results will be confirmed by numerical experiments in which MPRK schemes are applied to solve non-stiff and stiff systems of ordinary differential equations.