Contribution ID: **294** Type: **Talk in the parallel session**

A semi-implicit multidimensional unstructured gas dynamical solver for astrophysical applications

Friday, 9 July 2021 06:30 (20 minutes)

Astrophysical problems such as modelling of core-collapse supernovae, collapses of protostellar clouds as well as other processes, involving collapsing matter, deal with regions (e.g. protostars, protoneutron stars), where a speed of sound has much larger values, than in remaining parts of a computational domain. A time-step in explicit numerical schemes, thus, has to be bounded according to acoustic Courant-Friedrichs-Lewy condition, dictated mostly by the high speed of sound in these compact regions. In some cases, this condition can be very restrictive, and (semi-) implicit numerical schemes may outperform the explicit ones. We propose a semi-implicit solver on a collocated mesh for self-gravitating gas dynamical flows, in which only acoustic waves are treated implicitly. We use an operator-difference approach to construct difference analogues of vector differential operators on unstructured meshes in two and three dimensions, which allows us to save the conjugacy properties of the operators. We use a Rusanov-type dissipation to get monotonic flow profiles and usual linear flux reconstruction to improve an order of spatial approximation. Results of test calculations are presented.

Primary author: KONDRATYEV, Ilya (Space Research Institute RAS)

Co-author: MOISEENKO, Sergey (Space Research Institute, Moscow, Russia)

Presenter: KONDRATYEV, Ilya (Space Research Institute RAS)

Session Classification: MHD Processes Near Compact Objects

Track Classification: Accretion: MHD processes near compact objects