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Characteristic-based Volume Penalization Method for Arbitrary Mach Flows Around Solid Obstacles[1] NURLYBEK KASIMOV, ERIC BROWN-DYMKOSKI, OLEG VASILYEV, University of Colorado Boulder — A new volume penalization method to enforce boundary conditions on solid/moving/deformable obstacles of arbitrary shape for both Navier-Stokes and Euler equations is presented. The approach extends the Brinkman penalization to generalized Neumann and Robin boundary conditions by introducing hyperbolic penalization terms with characteristics pointing inward on solid obstacles. The boundary conditions for both integrated and non-integrated variables can be imposed in a systematic manner that parallels the prescription of exact boundary conditions. A principle advantage of the method is that it provides a systematic means of controlling the error. This approach is general and applicable to a wide variety of flow regimes. Examples of supersonic/subsonic viscous/inviscid complex geometry flows are given and discussed.

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