SLOPE LIMITERS FOR A VELOCITY RECONSTRUCTION IN ALE HYDRODYNAMICS

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There are more possibilities how to define bounds and limiters for vector field. Especially on polar grids, some definitions and corresponding slope limiters result in a violation of a symmetry. The Barth-Jespersen limiter [1] with bounds applied component by component violates the symmetry. Symmetry-preservation of the limiter can by achieved by projection of the vector into the flow direction [2] or by the rotationally-invariant bounds definition by the Vector Image Polygon (VIP) [3]. For the polar grids and a radial flow, a natural extension of the monotonicity criteria for vectors is an application of the bounds to the radial component of the vector. To preserve these bounds in the radial component, necessary modifications of the methods are presented.

The modified slope limiters are used for a piecewise-linear velocity/momentum reconstruction during the momentum remap. We concentrate on the bounds- and symmetry-preservation of the methods on polar grids. Two-dimensional cyclic remapping tests are used to demonstrate the properties of the limiters and resulting remap. Numerical results of these slope-limiter-based remapping methods are compared to the symmetry-preserving flux-based method [4].

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