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Flux-corrected transport II: Generalizations of the method

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Abstract

The recently developed method of Flux-Corrected Transport (FCT) can be applied to many of the finite-difference transport schemes presently in use. The result is a class of improved algorithms which add to the usual desirable properties of such schemes—conservation, stability, second-order (in some cases) accuracy, etc.—the property of maintaining the intrinsic positivity of quantities like density, energy density, and pressure. Illustrations are given for algorithms of the Lax-Wendroff, leapfrog, and upstreaming types. The errors introduced by the flux-correction process which lies at the heart of the method are cataloged and their effect described. Phoenical FCT, a refinement which minimizes residual diffusive errors, is analyzed. Applications of FCT to general fluid systems, multidimensions, and curvilinear geometry are described. The results of computer tests are shown in which the various types of FCT are compared with one another and with some conventional algorithms.

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