1014-65-1345   **Todd Arbogast** (`arbogast@ices.utexas.edu`), Department of Mathemetics, The University of Texas at Austin, 1 University Station C1200, Austin, TX 78712, and **Chieh-Sen Huang*** (`huangcs@math.nsysu.edu.tw`), Department of Applied Mathematics, National Sun Yat-sen University, 804 Kaohsiung, Taiwan. *A fully mass and volume conservating implementation of a characteristic method for transport problems.*

The characteristics-mixed method considers the transport not of a single point or fluid particle, but rather the mass in an entire region of fluid. This mass is transported along the characteristic curves of the hyperbolic part of the transport equation, and the scheme thereby produces very little numerical dispersion, conserves mass locally, and can use long time steps. However, since the shape of a characteristic trace-back region must be approximated in numerical implementation, its volume may be incorrect, resulting in inaccurate concentration densities and, further, inaccurate reaction dynamics. We present a simple modification to the characteristics-mixed method that conserves both mass and volume of the transported fluid regions. Our algorithm also handles boundary conditions through a space-time change of variables in the trace-back routines, which allows the boundary to be treated as if it were interior to the domain. Nearly point sources, such as injection wells, present special difficulties, since characteristic trace-back curves converge in their vicinity. We also present techniques that allow one to conservatively implement wells. (Received September 27, 2005)