1067-65-448   **Mary F. Wheeler** and **Guangri Xue*** (`gxue@ices.utexas.edu`), The University of Texas at Austin, ACE 5.318, ICES, 201 E 24th Street, Austin, TX 78712, and **Ivan Yotov**. *A multipoint flux mixed finite element method on distorted quadrilaterals and hexahedra.*

We develop a new mixed finite element method for elliptic problems on general quadrilateral and hexahedral grids that reduces to a cell-centered finite difference scheme. A special non-symmetric quadrature rule is employed that yields a positive definite cell-centered system for the pressure by eliminating local velocities. The method is shown to be accurate on highly distorted rough quadrilateral and hexahedral grids, including hexahedra with non-planar faces. Theoretical and numerical results indicate first-order convergence for the pressure and face fluxes. (Received September 03, 2010)