Meeting: 1003, Atlanta, Georgia, SIAMMINI 2, SIAM Minisymposium on Discontinuous Galerkin Methods: Theory and Applications

1003-65-345 **Rommel Bustinza*** (rbustinz@ing-mat.udec.cl), Universidad de Concepcion, Casilla 160-C, Departamento de Ingenieria Matematica, Concepcion, Chile, and **Gabriel N. Gatica** (ggatica@ing-mat.udec.cl), Universidad de Concepcion, Casilla 160-C, Departamento de Ingenieria Matematica, Concepcion, Chile. *A mixed local discontinuous finite element method for a class of quasi-Newtonian Stokes flows.* Preliminary report.

We present and analyze a mixed local discontinuous Galerkin finite element method for a class of quasi-Newtonian Stokes flows. The approach is based on the introduction of the flux and the tensor gradient of the velocity as further unknowns. Moreover, a suitable Lagrange multiplier is needed, in order to ensure that the corresponding discrete variational formulation is well posed. This yields a two-fold saddle point operator equation as the resulting LDG mixed formulation, which is reduced to a dual mixed formulation. Then, applying a slight generalization of the well known Babuška-Brezzi theory, we prove that the discrete formulation is well posed, and derive the associated a priori error analysis. We also develop an a-posteriori error estimate and propose a reliable adaptive algorithm to compute the finite element solutions. Finally, several numerical results illustrate the performance of the method and its capability to localize boundary and inner layers, as well as singularities. (Received September 10, 2004)