1057-65-332 **Zhiqiang Cai*** (zcai@math.purdue.edu), Department of Mathematics, 150 N. University Street, West Lafayette, IN 47907, and **Shun Zhang** (zhang@math.purdue.edu), Department of Mathematics, 150 N. University Street, West Lafayette, IN 47907. *Flux Recovery and A Posteriori Error Estimation: Conforming Elements for 2^{nd} Order Elliptic PDEs.*

In this talk, we will introduce two flux recovery procedures for the conforming finite element approximation to general second-order elliptic partial differential equations. One is accurate in a weighted L^2 norm for linear elements, and the other is accurate in a weighted $H(\mathrm{div})$ norm, up to the accuracy of the current finite element approximation.

For the L^2 recovered flux, we introduce an a posteriori error estimator that is more accurate than the explicit residual-based estimator. Based on the $H(\mathrm{div})$ recovered flux, we introduce two *a posteriori* error estimators. One estimator may be regarded as an extension of a recently developed recovery-based estimator to higher-order conforming elements. The global reliability and the local efficiency bounds for this estimator are established provided that the underlying problem is neither convection nor reaction dominant. The other is proved to be exact locally and globally on any given mesh with no regularity assumptions with respect to a norm depending on the underlying problem. Finally, numerical results on test problems for these estimators will be presented as well. (Received January 25, 2010)