1053-35-205   **Zhiwu Lin*** (`zlin@math.gatech.edu`), School of Mathematics, 686 Cherry Street, Atlanta, GA 30332. *Invariant Manifolds for Euler Equations.* Preliminary report.

Consider a linearly unstable steady state of 2D or 3D Euler equations of an inviscid fluid in a bounded domain. With Chongchun Zeng, recently we prove the existence of stable and unstable manifolds near such unstable flows under a spectral gap condition. In particular, the gap condition can be verified for any linearly unstable 2D and 3D shear. The existence of invariant manifolds reveals the local dynamical structures near an unstable flow. The main difficulties of proving existence of invariant manifolds for Euler equations are due to the loss of derivatives in the nonlinear terms and the non-smoothing property of the linearized Euler operator. We developed a mixed Eulerian and Lagrangian approach to handle these difficulties. This approach is being extended to prove invariant manifolds for several other problems in fluid and plasmas. (Received September 04, 2009)