1135-37-5 **Maleafisha J.P.S. Tladi*** (maleafisha.tladi@gmail.com), Department of Mathematics & Applied Mathemati, Sovenga, Limpopo 0727, South Africa. *Lagrangian Chaos and Transport in Geophysical Fluid Flows.*

Advances in our understanding of the dynamics of mesoscale eddies and vortex rings have been based on modons which are nonlinear Rossby solitary wave solutions of quasi-geostrophic equations. This article focuses primarily on geometric singular perturbation (GSP) theory and Melnikov techniques to address the problem of adiabatic chaos and transport for translating and rotating modons to the quasi-geostrophic potential vorticity system. A very general and central question is what hypotheses on the equations and singular solutions guarantee that the solutions approximate some solutions for the perturbed quasi-geostrophic potential vorticity system. We present a geometric approach to the problem which gives more refined a priori energy type estimates on the position of the invariant manifold and its tangent planes as the manifold passes close to a normally hyperbolic piece of a slow manifold. We apply Melnikov technique to show that the Poincare map associated with modon equations has transverse heteroclinic orbits. We appeal to the Smale-Birkhoff Homoclinic Theorem and assert the existence of an invariant hyperbolic set which contains a countable infinity of unstable periodic orbits, a dense orbit and infinitely many heteroclinic orbits. (Received May 18, 2017)