Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Stirring vortices with vorticity holes OSCAR VELASCO FUENTES, Departamento de Oceanografia Fisica, CICESE — A vorticity hole is a region with, in absolute value, significantly lower vorticity than its surroundings. Here we discuss the dynamics of a Rankine vortex with two equal circular holes. If a symmetric initial condition is assumed, the evolution depends on three parameters: the vorticity drop, the hole size and the distance between the holes. We computed the evolution with a contour-dynamics model and quantified the stirring of fluid particles using finite-time Lyapunov exponents and Melnikov's method. The vorticity holes evolve similarly to a pair of vortices in an otherwise quiescent fluid, although they are additionally affected by their interaction with the boundary of the Rankine vortex. The strongest stirring occurs when the holes interact elastically and then always in the center of the vortex. This result contradicts the generally accepted notion that vortices are regions of null to weak stirring.

Oscar Velasco Fuentes
Departamento de Oceanografia Fisica, CICESE

Date submitted: 02 Aug 2012 Electronic form version 1.4