Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Scattering and trapping of vortex pairs by a flat plate MONIKA NITSCHE, Univ of New Mexico — The interaction of a counter-rotating vortex pair with a flat plate in its path is studied numerically. The vortices are initially separated by a distance D and placed far upstream of a plate of length L. The plate is stationary, inclined relative to the incoming vortex trajectory, at an incident angle β_i. Generally, the vortices surround the plate and then leave as a dipole with unchanged velocity, but with a large change in the transmitted travel direction. This transmitted angle depends sensitively on changes in the incident angle, with increasing sensitivity as D/L decreases. In fact, for sufficiently small D/L, the dependence on β_i is highly singular. We show that there are intervals of incident angles in which the vortex trajectory undergoes repeated topological discontinuities, characterized by jumps in the vortex winding number and in the time they take to leave the plate. The discontinuities occur in a fractal self-similar fashion within the whole interval. These intervals furthermore contain incident angles that trap the vortices, which never leave the plate. The number of such trapping intervals increases as the parameter D/L decreases, and the dependence of the motion on β_i becomes increasing complex.

Monika Nitsche
Univ of New Mexico

Date submitted: 01 Aug 2017 Electronic form version 1.4