Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Why is the Karman vortex street so stable to the pairing instability? CRISTOBAL ARRATIA, SAVIZ MOWLAVI, FRANCOIS GALLAIRE, EPFL-LFMI — An infinite double row of staggered point vortices was proposed by von Karman as a simplified model for the alternating vortex street forming in the wake of blunt bodies. This model, however, was found to be always unstable except against infinitesimal disturbances when the aspect ratio of the vortex street has a precise value, a puzzling result in clear contradiction with experience. Several authors including Saffman, Kida and Jimenez studied extensions to Karman's point vortex model, but it turned out that instability for all but a specific value of the parameters is generic in these inviscid models (Jimenez, JFM 1987). Here, we revisit this classical problem from a spatio-temporal instability perspective, which is required for taking into account the propagation speed of the vortex street. We show that the instability of the point vortex model is convective for a large range of parameters, and comparison of the model with different physically relevant cases will be shown. We also consider the absolute/convective nature of the pairing instability in a single row of inviscid point vortices. In both cases we study the effect of confining walls which can be taken into account as an infinite series of image vortices.

Cristobal Arratia
EPFL-LFMI

Date submitted: 30 Jul 2013 Electronic form version 1.4