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Thomas Pecha, Thomas Retzloff and Alec Todd. *Study of Vortex Dynamics With Free*
Surface. Preliminary report.

We examine the deformation of varying shapes of collections of point vortices beneath a free surface of an inviscid fluid with a flat bottom boundary. Initial simulations investigate the deformation of vortex sheets in a manner which resembles the Kelvin-Helmholtz instability. With large numbers of point vortices, the simulations we run show that these sheets tend to deform into elliptical patches. Several other shapes of point vortex arrays are simulated, and almost all deform into an elliptical shape. Upon deciding to simulate an ellipse as a starting shape, we observe that an initial elliptical shape deforms the least with time. To increase the realism of these simulations, we introduce a mollified kernel, which slows the speeds of vortices that are close together and yields ellipses that retain their shape with time. We introduce a metric to measure the deformation of these ellipses before and after mollification. (Received September 23, 2017)