

**Movie 3.** Numerical simulations showing the time evolution of the vorticity field  $\zeta(x, y, t)$  with initial conditions

$$\zeta(x, y, 0) = \zeta_{1,2} J_1(\chi) \sin(\theta), \quad \chi \leq j_{1,2}.$$

Note  $j_{1,2} = 7.0155\dots$ . The vorticity amplitude is  $\zeta_{1,2} = 1$ . The numerical domain is a square with a side length  $L = 10\pi$ , discretized in  $1024^2$  grid points. Time step  $\delta t = 0.01$  and time save  $\Delta t = 1$ . The movie comprises the time interval  $t = [0, 270]$ .