Vortex with centered density perturbation

Doubly-periodic domain.

$$x \in [-0.5, 0.5], y \in [-0.5, 0.5], \tag{1}$$

$$r = \sqrt{x^2 + y^2}, \tag{2}$$

$$u = cos(2\pi x)sin(2\pi y), \tag{3}$$

$$v = sin(-2\pi x)cos(2\pi y), \tag{4}$$

$$\rho = \begin{cases} 1.0 + cos(2\pi(r - 0.25))^2 & \text{if } r < 0.5 \\ 1.0 & \text{otherwise} \end{cases} \tag{5}$$

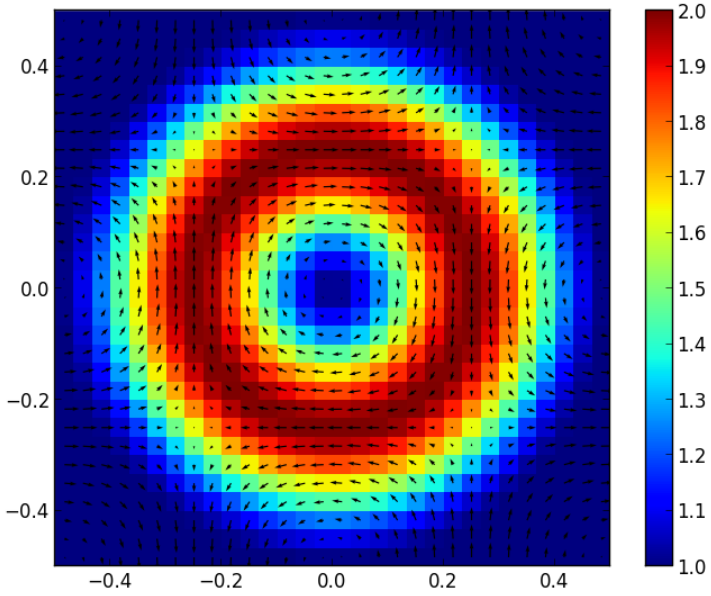

Figure 1: