

Open shear-driven square cavity

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Problem :

Boundary conditions :

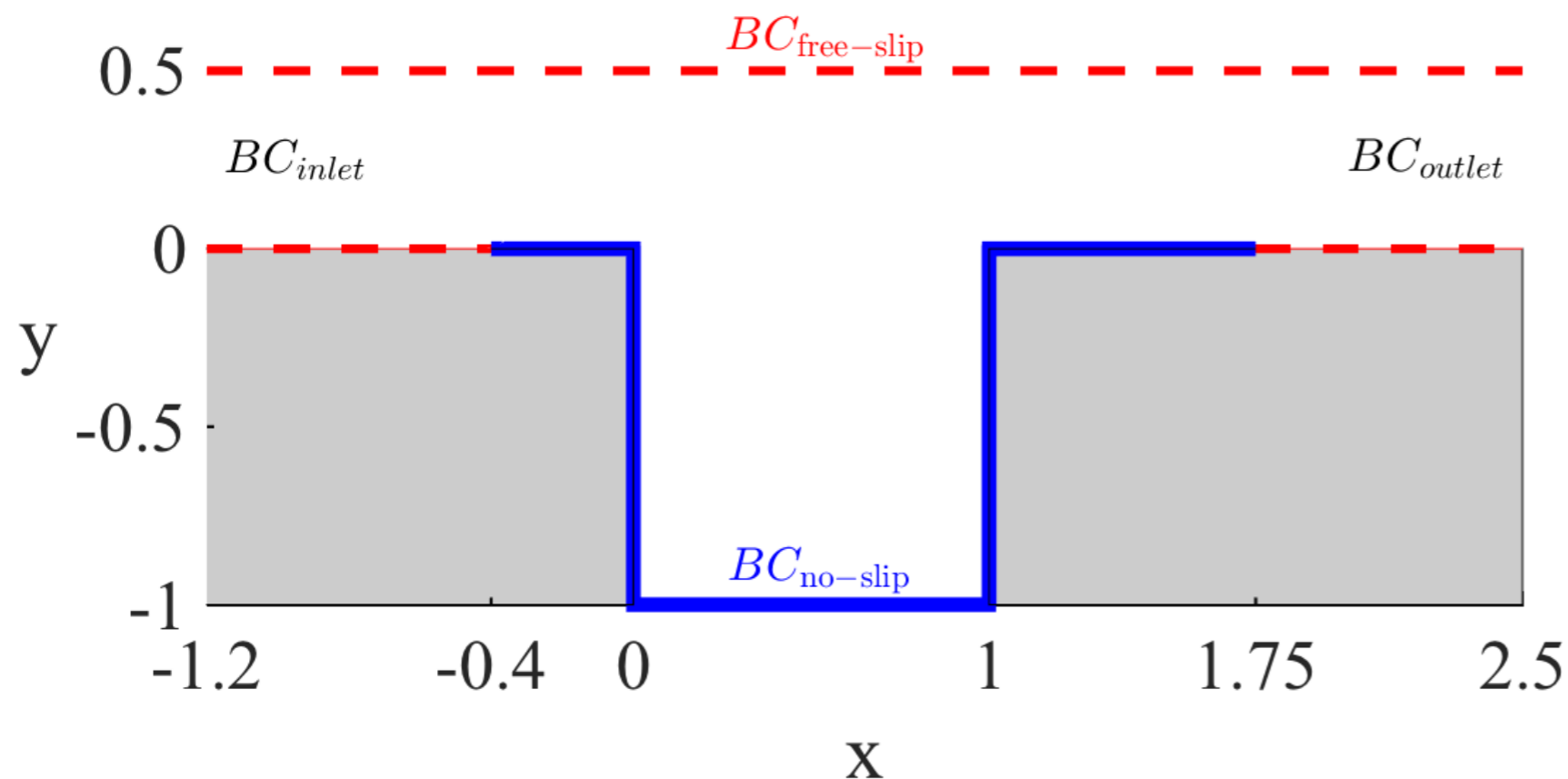
$$\mathbf{U} = \mathbf{e}_x \text{ on } BC_{\text{inlet}}$$

$$\mathbf{U} = \mathbf{0} \text{ on } BC_{\text{no-slip}}$$

$$\partial_y U = V = 0 \text{ on } BC_{\text{free-slip}}$$

$$\partial_x \mathbf{U} = \mathbf{0} \text{ on } BC_{\text{outlet}}$$

$$Re \in [4000, 5000]$$

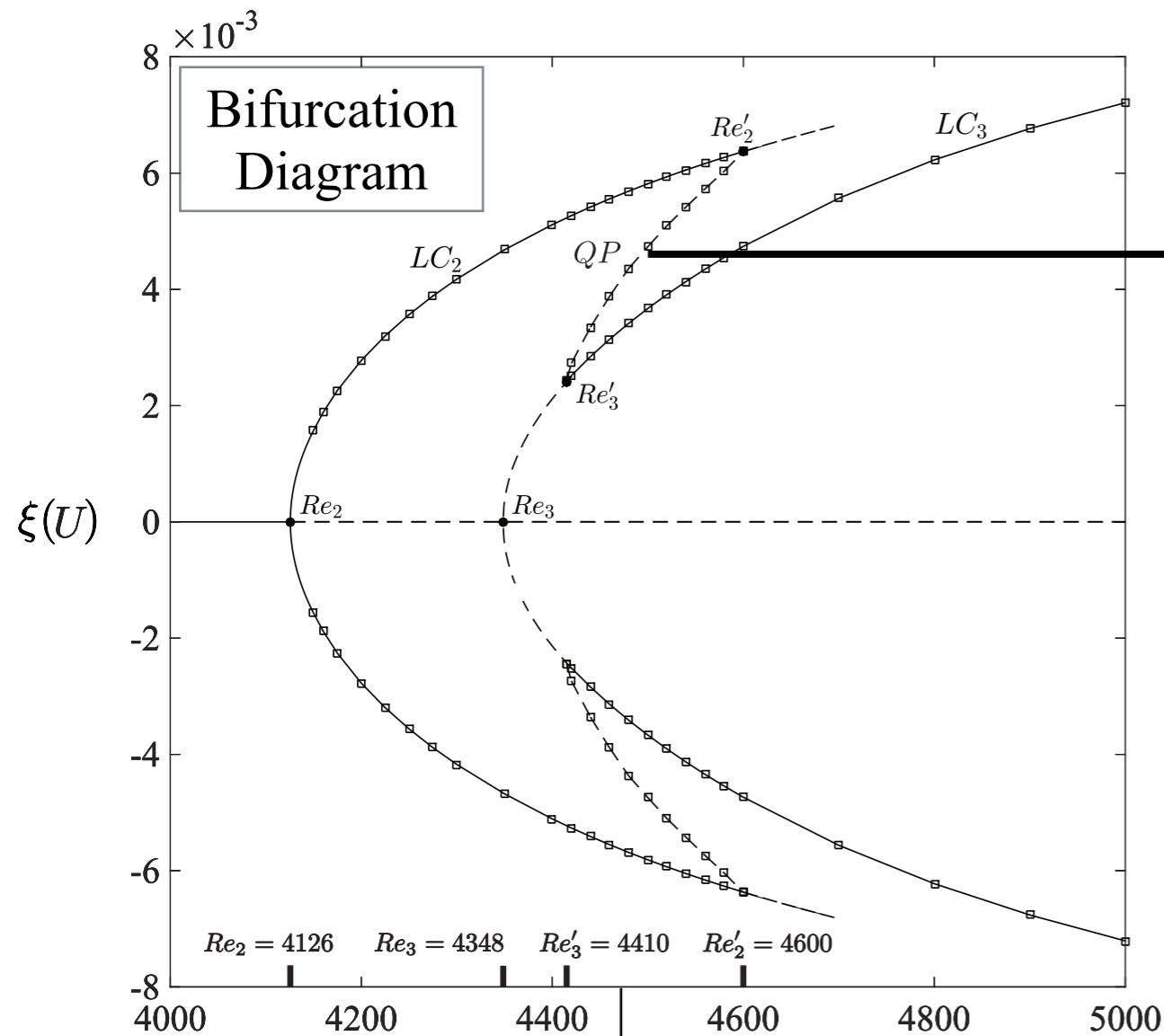


• Simulations use NEK5000
Fischer, Lottes, Kerkemeir, 2008

• Sipp & Lebedev JFM 2007

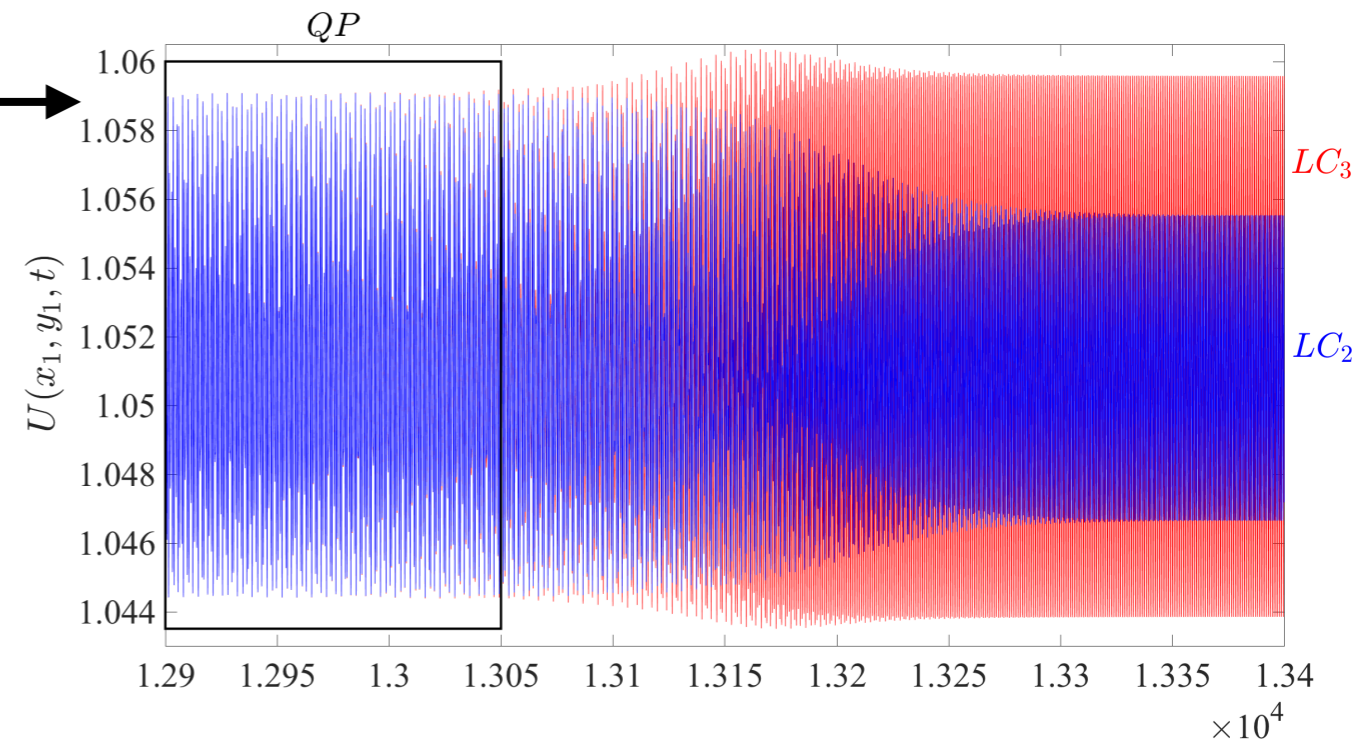
• Meliga JFM 2017

Results :



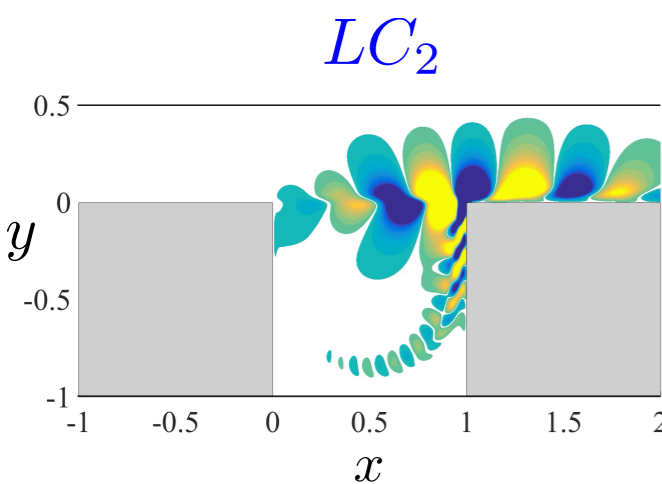
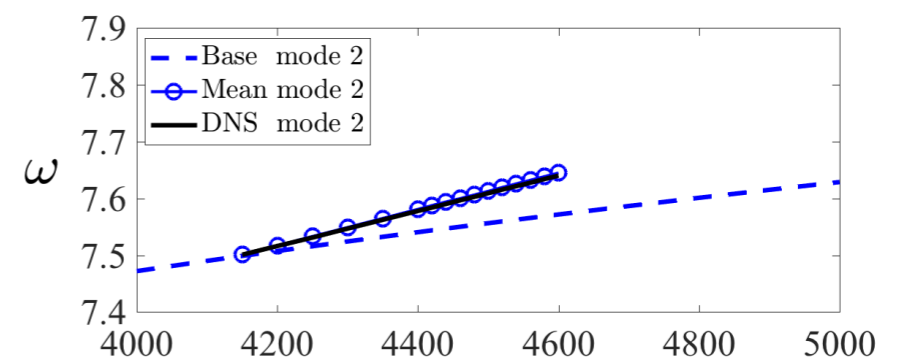
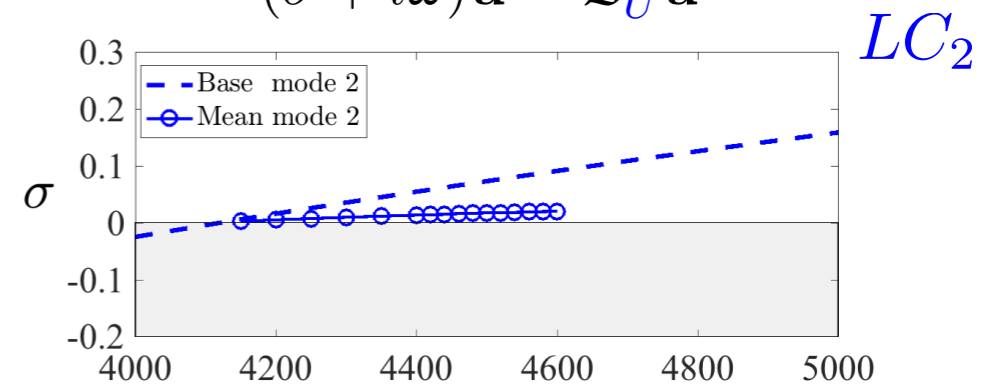
Quasi-periodic state

$$\mathbf{U}(\mathbf{x}) = \alpha \mathbf{U}_{LC_2} + (1 - \alpha) \mathbf{U}_{LC_3}$$

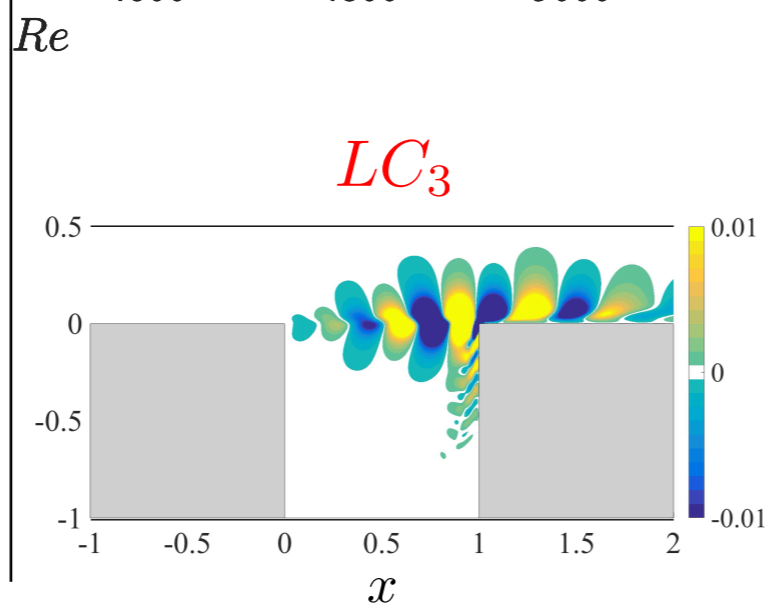


Linear stability analysis

$$(\sigma + i\omega) \hat{\mathbf{u}} = \mathcal{L}_{\bar{\mathbf{U}}} \hat{\mathbf{u}}$$



~ 2 vortex



~ 3 vortex

$$\mathbf{v}' = \mathbf{v} - \bar{\mathbf{v}}$$