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On the long time behavior of decaying 2D turbulence in bounded domains[1] KAI SCHNEIDER, MSNM–CNRS & CMI, Université de Provence, Marseille, France, MARIE FARGE, Ecole Normale Superieure, Paris, France — Two–dimensional turbulence in bounded domains has many applications in geophysical flows, *e.g.*, the prediction of coastal currents to study the transport and mixing of pollutants in oceans. We present Direct Numerical Simulations of 2D turbulence in bounded domains for different geometries. The Navier-Stokes equations are solved in a periodic square domain using the vorticity–velocity formulation. The bounded domain is imbedded in the periodic domain and the no–slip boundary conditions on the wall are imposed using a volume penalisation technique. The numerical integration is done with a Fourier pseudo-spectral method combined to a semi-implicit time discretization with adaptive time-stepping. The aim of the present paper is to study the influence of the geometry on the flow dynamics, and in particular on the long time flow behavior. We study different shapes for the bounded domain : a circle, a square, a triangle and a torus. The numerical results thus obtained are compared with theoretical predictions based on the eigenfunctions of the biharmonic operator of the corresponding domain shape.

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