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The dependence of vortex population properties on resolution and on initial conditions in two-dimensional turbulence

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Two-dimensional, barotropic, turbulence has been widely investigated and represents a simple conceptual model for geophysical flows dominated by long lived vortices. In freely decaying barotropic turbulence, coherent vortices emerge from random initial conditions and proceed to interact through vortex advection and merger of same-sign vortices. A self-similar evolution in time of vortex properties characterizes this phase (Carnevale et al. 1991).

The initial vortex formation process and, in particular, the dependence of the vortex population properties on the initial conditions and on the amount of dissipation (the resolution of numerical experiments) has instead still to be clarified. We investigate and discuss this issue using numerical experiments at a range of different resolutions (up to $4096ˆ2$ grid points) and for different initial conditions (from peaked to broader spectra).