

## The interaction of two point vortices with sources in an unsteady 2D shear flow and the transition to chaos

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*Abstract:* Recent work has shown that a proper description of the ocean mesoscale turbulence requires oceanatmosphere coupling. In this work, we take this coupling into account by using the fully coupled wind stress curl acting on an axisymmetric vortex. We show that this generates a source/sink flow in an isolated circular vortex. To assess the consequences of this flow on vortex interaction, we first consider two such vortices, with zero spatial extent (point vortices) and associated with a source or a sink. We calculate the trajectories of this vortex pair. We add an external shear flow, typical of oceanic conditions. We calculate the fixed points and stability of this system. Then we assume that the external shear flow is time varying (with a small periodic component). Using a perturbation expansion, we calculate the nonlinear response of the vortex pair to this fluctuating flow. We analyse how this quasi-periodic response can bifurcate towards chaotic evolution when the external oscillating flow becomes more intense. We analyse the chaotic trajectories thus created.

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