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Stirring Generated by a Pair of Elliptic Vortex Patches LUCA CORTELEZZI, McGill University, IGOR MEZIC, University of California Santa Barbara — In this two-dimensional study we analyze the stirring generated by two elliptical vortex patches. The domain is infinite and the fluid is inviscid and incompressible. We consider the condition of pure advection, where diffusion and chemical reactions are neglected. Vorticity of the same sign and magnitude is uniformly distributed over the patches. The resulting flow is laminar and quasi-periodic. However, it is a finite-time type of flow because the vortices would eventually merge. The time-evolution of the patches is computed using a contour dynamic algorithm which solves Euler's equations. We consider as initial unstirred field the case where the fluid is colored differently in the top and bottom half-planes. The stirring efficiency is intimately related to the motion of co-rotation of the vortex pair and the rotation of each vortex about itself. We characterize stirring in terms of interface stretching, patchiness and mixnorm. We show that vortices with lower aspect-ratio (= minor-axis/major-axis) have better stirring efficiency although they are more prone to deform and merge. We also show that the period of rotation modulates the time evolution of the mixnorm and interface stretching. We use computer animations to discuss the stirring mechanisms.

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