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Interaction of Tubular Vortices as a Function of Contact Angle
OSCAR VELASCO FUENTES, Departamento de Oceanografia Fisica, CICESE, Mexico — We study the evolution of two equal tubular vortices, which initially touch each other, as a function of the angle formed by their centerlines at the point of contact. To this end we solve the vorticity equation in a triple-periodic domain with a vortex-in-cell method, using as initial conditions two helical vortices of equal circulation Γ, pitch L, radius R and core radius a. The axes of the helices are parallel lines separated by a distance $2R+2a$, so that the vortices touch each other at a single point within the numerical domain. At this point the vortices centerlines make an angle $\alpha = 180^\circ - 2\tan^{-1}(L/2\pi R)$. We analyzed the flow evolution by monitoring the position and topology of iso-surfaces of vorticity magnitude as well as the distribution of fluid particles initially located within the vortices. Both methods yield the same results in the identification of the following regimes: for small angles ($\alpha \to 0^\circ$) the vortices merge in a time that increases with the angle, for large angles ($\alpha \to 90^\circ$) the vortices reconnect in a time that decreases with the angle, for intermediate angles the vortices exchange mass but keep their identity during the whole simulation.

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