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Motion of multiple helical vortices OSCAR VELASCO FUENTES, Departamento de Oceanografia Fisica, CICESE, Mexico — In 1912 Joukowsky deduced that in an unbounded ideal fluid a set of helical vortices —when these are equal, coaxial and symmetrically arranged— would translate and rotate steadily while the vortices preserve their form and relative position. Each vortex is an infinite tube whose cross-section is circular (with radius a) and whose centerline is a helix of pitch L and radius R. The motion is thus determined by three non-dimensional parameters only: the number of vortices N, the vortex radius $\alpha = a/R$ and the vortex pitch $\tau = L/2\pi R$. Here, we express the linear and angular velocities of the vortices as the sum of the mutually induced velocities found by Okulov (2004) and the self-induced velocities found by Velasco Fuentes (2015). We verified that our results are accurate over the whole range of values of the vortices' pitch and radius by numerically computing the vortex motion with two smoothed versions of the Biot-Savart law. It was found that the translation velocity U grows with the number of vortices (N) but decreases as the vortices' radius and pitch (a and τ, respectively) increase; in contrast, the rotation velocity Ω grows with N and a but has a local minimum around $\tau = 1$ for fixed values of N and a.

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