Numerical simulation of tripolar vortices in 2D flow

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The formation of a tripolar vortex in a two-dimensional flow is simulated numerically for two different cases, viz. the tripole arising from a collision of two Lamb dipoles, and the emergence of a tripole from an initially axisymmetric, unstable vortex. This latter situation was also considered in a laboratory experiment by van Heijst, Kloosterziel and Williams, and the numerical results show very good agreement with their observations, both qualitatively and quantitatively. Under certain conditions a higher wavenumber instability is found, resulting in a triangular vortex which itself turns out to be unstable. The results of the numerical simulation agree fairly well with laboratory observations of this higher-order instability scenario.

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