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Contraction of an inviscid swirling liquid jet: Comparison with results for a rotating granular jet. P.D. WEIDMAN, J.P. KUBITSCHEK, University of Colorado — In honor of the tercentenary of Leonhard Euler, we report a new solution of the Euler equations for the shape of an inviscid rotating liquid jet emanating from a tube of inner radius R_0 aligned with gravity. Jet contraction is dependent on the exit swirl parameter $\chi_0 = R_0\ \Omega_0/U_0$ where Ω_0 and U_0 are the uniform rotation rate and axial velocity of the liquid at the exit. The results reveal that rotation reduces the rate of jet contraction. In the limit $\chi_0 \rightarrow 0$ one recovers the contraction profile for a non-rotating jet and the limit $\chi_0 \rightarrow \infty$ gives a jet of constant radius. In contrast, experiments and a kinematic model for a rotating non-cohesive granular jet show that it expands rather than contracts when a certain small angular velocity is exceeded. The blossoming profiles are parabolic in nature. The model predicts a jet of uniform radius for $\chi_0 \rightarrow 0$ and a jet with an initially horizontal trajectory in the limit $\chi_0 \rightarrow \infty$.

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