Abstract Submitted
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Axisymmetric Vortices with Swirl A. ELCRAT, Wichita State University — This talk is concerned with finding solutions of the Euler equations by solving elliptic boundary value problems for the Bragg-Hawthorne equation L u= -urr -(1/r)ur - = r^2f (u) + h(u). Theoretical results have been given for previously (Elcrat and Miller, Differential and Integral Equations 16(4) 2003, 949-968) for problems with swirl and general classes of profile functions f, h by iterating Lu(n+1)= rf(u)n)) + h(u(n)), and showing u(n) converges montonically to a solution. The solutions obtained depend on the initial guess, which can be thought of as prescribing level sets of the vortex. When a computational program was attempted these monotone iterations turned out to be numerically unstable, and a stable computation was acheived by fixing the moment of the cross section of a vortex in the merideanal plane. (This generalizes previous computational results in Elcrat, Fornberg and Miller, JFM 433 2001, (315-328) We obtain famillies of vortices related to vortex rings with swirl, Moffatt's generalization of Hill's vortex and tubes of vorticity with swirl wrapped around the symmetry axis. The vortices are embedded in either an irrotational flow or a flow with shear, and we deal with the transition form no swirl in the vortex to flow with only swirl, a Beltrami flow.

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