

Abstract Submitted
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On the Decay of Axial Flow in a q-Vortex GREGORY BLAISDELL,
Purdue University — A q-vortex is a model isolated vortex flow with both axial and azimuthal velocity components. The presence of an axial flow of sufficient strength results in an instability. Previous direct numerical simulations of a turbulent q-vortex have shown that as the turbulence develops the mean flow changes such that the axial velocity decreases more rapidly than the azimuthal velocity. As the flow becomes swirl dominated, the instability is lost and the turbulence decays. What has been unclear is why the axial velocity decays more rapidly than the azimuthal velocity. Examination of the laminar self-similar solution on which the q-vortex is based reveals a similar behavior. By considering the azimuthal and axial components of vorticity a simple explanation is found for why the axial velocity decays more quickly than the azimuthal velocity. This explanation is valid for the turbulent case as well.

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