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Regenerative growth due to axial flow induced by vortex-turbulence interaction ERIC STOUT, FAZLE HUSSAIN, Texas Tech University — Direct numerical simulations of a vortex column embedded in fine scale homogeneous, isotropic turbulence reveals an inviscid mechanism for induction of axial flow on the column. Vortex threads, produced outside the column during vortex-turbulence interaction, are shown to drive the mechanism of axial flow generation. Oppositely oriented threads radially separate by self-induction, hence causing net axial flow. At computationally accessible Reynolds numbers (Re≡vortex circulation/viscosity=10 000), the axial flow due to a pair of oppositely signed vortex threads outside the column increases both with Re and time. At high Re, the axial flow can increase sufficiently to render the vortex column unstable by the well-known q criterion. The vorticity field reveals that axial flow is another mechanism, perhaps more dominant than the parent-offspring hairpin vortex scenario (Hussain, Pradeep & Stout JFM 2011), of regenerative energy growth – likely to be important for implementing breakup of aircraft trailing vortices.

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