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Maximum Production of Enstrophy in Swirling Viscous Flows DIEGO AYALA, CHARLES DOERING, Univ of Michigan - Ann Arbor — We study a family of axisymmetric vector fields that maximize the instantaneous production of enstrophy in 3-dimensional (3D) incompressible viscous flows. These vector fields are parametrized by their energy $\mathcal{K}$, enstrophy $\mathcal{E}$ and helicity $\mathcal{H}$, and are obtained as the solution of suitable constrained optimization problems. The imposed symmetry is justified by the results reported in the seminal work of Doering & Lu (2008), recently confirmed independently by Ayala & Protas (2016), where highly-localized pairs of colliding vortex rings are found to be optimal for enstrophy production. The connection between these optimal axisymmetric fields and the "blow-up" problem in the 3D Navier-Stokes equation is discussed.

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