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A minimal support for turbulence in a restricted nonlinear (RNL) model VAUGHAN THOMAS, DENNICE F. GAYME, Johns Hopkins University, BRIAN FARRELL, Harvard University, PETROS IOANNOU, National and Kapodistrian University of Athens — In this work we explore the range of streamwise varying perturbations that can support self-sustaining turbulence in a restricted nonlinear (RNL) model of plane Couette flow. The RNL model partitions the dynamics of the flow field into a streamwise averaged mean flow and streamwise varying perturbations about that mean. The resulting system is a minimal representation of self-sustaining turbulence in which only a small number of streamwise varying perturbations interact with the mean flow. In the current work, we show that there is a minimum and maximum streamwise wavelength associated these streamwise perturbations. We also demonstrate that RNL turbulence can also be supported when the dynamics are further restricted to a single streamwise varying perturbation. This minimal RNL system possesses an upper and lower limit on the wavelengths associated with the single streamwise varying perturbation that is able to support RNL turbulence, i.e. when restricted to a perturbation whose wavelength is outside of this range, the RNL system returns to a laminar state.

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