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**Perturbing turbulence beyond collapse** JAKOB KHNEN, DAVIDE SCARSELLI, BJRN HOF, IST Austria, NONLINEAR DYNAMICS AND TURBULENCE GROUP TEAM — Wall-bounded turbulent flows are considered to be in principle stable against perturbations and persist as long as the Reynolds number is sufficiently high. We show for the example of pipe flow that a specific perturbation of the turbulent flow field disrupts the genesis of new turbulence at the wall. This leads to an immediate collapse of the turbulent flow and causes complete relaminarisation further downstream. The annihilation of turbulence is effected by a steady manipulation of the streamwise velocity component only, greatly simplifying control efforts which usually require knowledge of the highly complex three dimensional and time dependent velocity fields. We present several different control schemes from laboratory experiments which achieve the required perturbation of the flow for total relaminarisation. Transient growth, a linear amplification mechanism measuring the efficiency of eddies in redistributing shear that quantifies the maximum perturbation energy amplification achievable over a finite time in a linearized framework, is shown to set a clear-cut threshold below which turbulence is impeded in its formation and thus permanently annihilated.

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