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Spontaneous transition to a fast 3D turbulent reconnection regime LAPO BETTARINI, ULB, GIOVANNI LAPENTA, KU Leuven — We show how the conversion of magnetic-field energy via magnetic reconnection can progress in a fully three-dimensional, fast, volume-filling regime. An initial configuration representative of many laboratory, space and astrophysical plasmas spontaneously evolves from the well-known regime of slow, resistive reconnection to a new regime that allows to explain the rates of energy transfer observed in jets emitted from accretion disks, in stellar/solar flare processes as well as in laboratory plasmas. This process does not require any pre-existing turbulence seed which often is not observed in the host systems prior to the onset of the energy conversion. The dynamics critically depends on the interplay of perturbations developing along the magnetic-field lines and across them, a process possible only in three dimensions. The simulations presented here are the first able to show this transition in a fully three-dimensional configuration.

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