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The Formation of Packets of Hairpins in Shear Flows¹ JACOB COHEN, MICHAEL KARP, Technion, Faculty of Aerospace Engineering, ILIA SHUKHMAN, Russian Academy of Sciences, Irkutsk — In the present work we utilize a recently developed new method in an attempt to understand the generation of packets of hairpin vortices from a pair of counter rotating streamwise vortices embedded in uniform shear flow. This analytical-based solution method is capable of following (numerically) the evolution of finite-amplitude localized vortical disturbances embedded in shear flows. Due to their localization in space, the surrounding base flow is assumed to have homogeneous shear to leading order. The method can solve in a novel way the interaction between a general family of unbounded planar homogeneous shear flows and any localized disturbance. The solution is carried out using Lagrangian variables in Fourier space which is convenient and enables fast computations. The revealed mechanism for generation of packets of hairpins seems to be universal and has been observed in the past both in fully developed wall-bounded shear flows as well as in wall-bounded transitional shear flows.

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