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Long-wave instabilities of general shear flows for 2D viscous fluids

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In 1959, Kolmogorov proposed to study the instability of the shear flow (sin(y),0) in the vanishing viscosity regime in tori of different aspect ratios. This question was later resolved by Meshalkin and Sinai in the '60s. Generalizing their picture, we focus on instability properties for general shear flows (U(y),0) and we show that they always exhibit a long-wave instability mechanism. This confirms previous findings by Yudovich in 1966 and is established through two independent approaches: one via the construction of Kato's isomorphism and one via normal forms. In both cases, unlike in many other applications of these methods, the corresponding operators are not small perturbations of a given simpler operator. This is a joint work with M. Colombo, P. Ventura and R. Montalto.

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