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Mechanics and characteristics of transition to turbulence in elasto-inertial turbulence VINCENT TERRAPON, Aerospace & Mechanical Engineering Dept, University of Liege, Belgium, JULIO SORIA, Mechanical Engineering Dept, Monash University, Australia, YVES DUBIEF, School of Engineering, University of Vermont VT — Numerical experiments of transition in elasto-inertial turbulent channel flows are used to highlight the mechanisms of transition and characterize the MDR regime. Specifically, the pressure kernel from the generalized pressure Poisson equation is used to demonstrate the role of elastic instabilities in inducing and sustaining a turbulent-like flow. Additionally, dynamic mode decomposition is applied to statistically steady viscoelastic flows at different Reynolds number to identify the relative contributions of elastic and inertial instabilities. It is shown that elastic instabilities can be triggered through long-range interactions from disturbances in the free-stream, similarly to by-pass transition, and are then sufficient to self-sustain. When the Reynolds number is increased, the relative contribution of inertial instabilities becomes more important, and the flow demonstrates features that are characteristic to Newtonian turbulent flows (e.g., streaks, quasi-streamwise vortices), although at lower intensity.

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