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Temperature-Gradient Effects on Taylor–Couette Flows M. KHIRENNAS, H. OUALLI, M. MEKADEM, A. BENAICHE, T. AZZAM, Ecole Militaire Polytechnique, Algiers, Algeria, A. BOUABDALLAH, Université des Sciences et de la Technologie Houari Boumediene, Algiers, Algeria, M. GAD-EL-HAK, Virginia Commonwealth University, Richmond, Virginia, USA — A numerical investigation of a Taylor–Couette flow with a heated rotating inner cylinder and an isothermal stationary outer one. We focus on the effect of temperature gradients on the first instability formation. The calculations are implemented on FLUENT based on the finite-volume method. The basic system geometry is characterized by its height, ratio of inner-to-outer cylinder radii, radial gap length, and aspect ratio. For validation, the present results compare well to the high-order DNS computations of Viazzo & Poncet (*Computers & Fluids*, vol. 101, pp. 15–26, 2014). The genesis mechanism of Ekman and Taylor vortices is revisited herein to shed light on the temperature-gradient effects on the flow restructuring. It is concluded that the flow behavior exhibits considerable sensitivity to temperature gradient, leading to strong stabilizing effect. The flow topology is found to shift instantly to the known Benard convective cell for all flow evolution stages even at the end of the restructuring process. The critical Taylor number is substantially increased according to the superimposed temperature gradient as characterised by Rayleigh number. An increase of 30% in the critical Taylor number is observed when Rayleigh number is 7,150.

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