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A novel control strategy for a Taylor–Couette flow A. BOUABDALLAH, Universite des Sciences et de la Technologie Houari Boumediene, Algiers, Algeria, H. OUALLI, M. MEKADEM, M. BOUKRIF, S. SAAD, Ecole Militaire Polytechnique, Algiers, Algeria, M. GAD-EL-HAK, Virginia Commonwealth University, Richmond, Virginia, USA — Advancing transition is desired in applications where heat, mass, or momentum transfer needs to be augmented. On the other hand, delaying transition is imperative in crystal growth devices, where all instabilities are to be avoided in order to prevent the appearance of geometrical irregularities in the resulting crystal. The hydrodynamic stability of a viscous flow in a closed, fully filled Taylor–Couette system is considered in the present numerical study. The fluid evolves in an annular cavity between the rotating inner cylinder and the outer fixed one. The base flow is axis-symmetric with two counter-rotating vortices each wavelength. The Taylor number varies in the range of 0–50. Numerical simulations are implemented on a finite-volume CFD code. The control strategy involves a pulsatile motion superimposed separately on the inner and outer cylinder's cross-section, with maximum amplitude of, respectively, 5% and 15% of the radius. The frequency varies in the range of 0–100 Hz. The objective is to localize the transition and to assess the flow's response to the imposed boundary motions. Substantial advancement of transition is found when the inner cylinder's cross-section is varied, while this transition is delayed when the outer cylinder's cross-section is pulsating.

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