Wavy toroidal and helicoidal vortices in Taylor-Couette with axial and radial through-flows[1] DENIS MARTINAND, Aix-Marseille Université, ERIC SERRE, CNRS, NILS TILTON, University of Maryland, RICHARD LUEPTOW, Northwestern University — Based on previous stability analyses of a Taylor-Couette cell with superimposed axial and/or radial through-flows, a weakly nonlinear approach is used to determine the saturated states of the toroidal or helicoidal marginal instabilities above their relevant thresholds. These saturated states are then used to compute secondary instabilities in the form of wavy vortices by Floquet analysis. Different scenarios for this secondary transition are assessed, involving harmonic or subharmonic, convective or absolute, secondary modes. The effects of the axial and radial through-flows on these secondary modes and their critical conditions are then addressed. The analytical results are compared to direct numerical simulations of supercritical flows using spectral methods.

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