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Simultaneous Rotational and Axial Flow of Nonlinear Fluids NARIMAN ASHRAFI, MEHDI YEKTAPOUR, MEHDI SHAFAHI, Science and Research Branch, Islamic Azad University, Tehran, Iran — An axial flow is introduced to the rotational flow of pseudoplastic fluids in the gap between concentric cylinders. The outer cylinder is fixed while the inner one has simultaneous and independent rotational and translational motions. The fluid follows the Carreau–Bird model and mixed boundary conditions are imposed. The four-dimensional low-order equations resulted from Galerkin projection of the conservation of mass and momentum equations, includes highly non-linear terms in the velocity components. Without axial flow, stability of the base radial flow is lost to the vortex structure at a lower critical Taylor number, with increase of the fluid pseudoplasticity. The vortices imply onset of a supercritical bifurcation which occurs in the rotational flow of linear fluids as well. In contrast to the Newtonian case, pseudoplastic Taylor vortices lose their stability at a second critical Taylor number is reached a second critical number that corresponds to the onset of a Hopf bifurcation. The axial flow, caused by the translational motion of the inner cylinder advance each critical point on the bifurcation diagram. The flow field and viscosity maps are provided for major stability regions

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