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Secondary flow transitions in the differentially heated rotating annulus

We present some results on the secondary flow transitions that occur in the differentially heated rotating annulus. In particular, we seek secondary bifurcations in a model of the annulus that uses the three dimensional Navier-Stokes equations in the Boussinesq approximation. The flows that may be observed after transition can be quasi-periodic, and include flows such as mixed-mode and amplitude vacillating solutions. We discuss the nature of these flows and the bifurcations that lead to them. In particular, the quasi-periodic flows correspond to 2-tori in phase-space and result from a bifurcation from a periodic orbit, which corresponds to a rotating wave in the annulus. We also discuss the numerical techniques used to compute the flows and bifurcations.

This is joint work with Nicolas Perinet and Lennaert van Veen.