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Small-scale flow patterns at the vertical sidewalls of the thermally driven rotating annulus

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We report on small-scale instabilities in the thermally driven rotating annulus filled with a liquid of moderate Prandtl number. Our study is based on numerical computations and accompanying laboratory experiments. The computations were performed independently with two different flow solvers, that is the finite volume flow solver EULAG and a higher order finite difference compact scheme (HOC). We found small-scale flow patterns at both vertical sidewalls of the annulus, the cooled inner sidewall and the heated outer one. Obviously, these small-scale instabilities are localized and connected to the large-scale baroclinic wave field. While the existence of small-scale flow structures at the inner sidewall is already described in recent publications, e.g., [1], [2], the occurrence of short wavelength waves at the outer sidewall has not been reported yet. Here, we focus on characterising the dynamics of the small-scale patterns at the outer sidewall. Physical mechanisms that might trigger these patterns are discussed.

References:

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[2] Randriamampianina, A. & Crespo del Arco, E., 2015, Inertia-gravity waves in a liquid-filled, differentially heated, rotating annulus. J. Fluid Mech., 782, 144-177.