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Solitary states in the Taylo-Couette system with a radial temperature gradient[1] CLÉMENT SAVARO, ARNAUD PRIGENT, INNOCENT MUTABAZI, LOMC, UMR6294, CNRS-Université du Havre — The vertical Taylor-Couette system with a radial temperature gradient exhibits a rich variety of states since the base flow state is a combination of the circular Couette flow and an axial baroclinic flow. Two main control parameters characterize the flow: the Taylor number (Ta) for the rotation and the Grashof number (Gr) for the temperature difference. For small values of Gr, the critical state is the Taylor vortices, and for large values of Gr, the critical states appear either in form of helicoidal vortices or modulated waves. For a fixed value of Gr, increasing Ta leads to the appearance of higher instability modes where helicoidal vortices or traveling waves bifurcate into contrarotating vortices. A special attention will be focused on the states observed for $|Gr| > 1500$ and $Ta \simeq 12$ when the base state bifurcates to a state of modulated wave. A small increase of Ta leads to the appearance of a solitary wave which is superimposed to the modulated wave state. Using visualization technique and particle image velocimetry (PIV) coupled with liquid crystal thermography (TLC), we have measured the amplitude of the solitary structure from velocity and temperature fields. The spatial and temporal localizations give the signature of the solitary wave.

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