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**Experimental study of the statistics of a gravity-wave instability in a Taylor-Couette system with free surface** JULIAN MARTINEZ MERCADO, CRISTOBAL ARRATIA, NICOLAS MUJICA, Departamento de Fisica, FCFM, Universidad de Chile — In this work, we study the occurrence of a gravity-wave instability in a turbulent Taylor-Couette system with a free surface. In such configuration the system can bifurcate from an axisymmetric turbulent base state to a $m = 1$ gravity wave state, where a wave grows from a resonant mode of the free surface taking the energy from the turbulent base state. We use the Froude number $F_r = (a\omega)^2/gh$ to characterize the bifurcation, where $a$ is the radius of the inner cylinder, $\omega$ its angular velocity, $g$ the gravity acceleration and $h$ the height of the free surface. We show that the observed instability is subcritical, presenting bistability and hysteresis. The measured bifurcation curve can be fitted with the deterministic amplitude equation $\partial_t u = \epsilon u + \nu u^2 - \gamma u^3$, being $u$ the wave's amplitude, although differences are observed due to noise induced by turbulence. The growing rate of the wave's amplitude $\sigma$ varies linearly with $F_r - F_{rc}$. Moreover, the probability distribution of the wave's amplitude can be expressed as a functional of the form $\ln c_0 - c_1 u^2 + c_2 u^3 - c_3 u^4$, resulting from the use of a Fokker-Planck equation to obtain the probability distribution for this type of bifurcation.

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