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Experimental modelling of bistability in mid-latitude atmospheric jets

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Bistability, a striking property of some climate features, can be obtained in purely hydrodynamic systems in turbulent regimes and can be explained in terms of statistical mechanics. Here, we report laboratory experiments reproducing mid-latitude atmospheric jets in an annular rotating tank. The jet is influenced by a non-axisymmetric bottom topography interfering with the natural wavy pattern of the jet, which is related to a barotropic instability. Two states emerge from this interaction: a wave 'blocked' with respect to the topography, and a freely propagating wave. These two states are obtained with the same control parameters, the chosen state depending on the history of the system. No spontaneous transition between the two states is observed, in spite of the strong turbulent fluctuations. The response of the system to external noise will also be presented, following which possible applications of our results to oceanic currents and associated ten-year climatic fluctuations will be discussed.