Abstract Submitted
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The nature of oscillatory modes in turbulent Rayliegh-Bénard convection[1] ERIC BROWN, GUENTER AHLERS, Dept. of Physics and iQCD, University of California, Santa Barbara — Measurements of oscillatory modes of the large-scale circulation (LSC) of turbulent Rayleigh-Bénard convection in water-filled cylindrical containers of equal height and diameter are presented. To observe and distinguish different modes, temperatures were measured simultaneously around the side wall at 8 azimuthal angles and 3 heights. A previously observed intrinsic mode consists of an azimuthal twist of the LSC circulation-plane around the orientation at mid-height, with the top and bottom oscillating *out of phase* by half a cycle. The oscillation amplitude varied irregularly in time, yielding a Gaussian probability distribution for the difference in LSC orientation at different heights. This is reproduced by the equation of motion of a stochastically-driven damped harmonic oscillator. This mode differs from a previously unknown *planar* oscillation around a fixed orientation due to an asymmetry, in which the top and bottom of the LSC oscillate *in phase*. The planar mode was observed in a container tilted relative to gravity, and predicted using a model that yields an LSC orientation given by the equation of a stochastically-driven damped harmonic oscillator in which the tilt-modified buoyancy of the thermal boundary layers provides the restoring force.

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Eric Brown
Dept. of Physics and iQCD, University of California, Santa Barbara

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