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A fluid Foucault pendulum: the impossibility of achieving solid-body rotation on Earth ROBERT BLUM, DANIEL ZIMMERMAN, SANTIAGO TRIANA, DANIEL LATHROP, University of Maryland, College Park — Rotating fluid dynamics is key to our understanding of the Earth's atmosphere, oceans, and core, along with a plethora of astrophysical objects. Laboratory study of these natural systems often involves spinning experimental devices, which are assumed to tend to rigid rotation when unstirred. We present results showing that even at the tabletop scale, there is a measurable oscillatory flow driven by the precession of the experiment's axis as the earth rotates. We measure this flow in a rotating cylinder with an adjustable aspect ratio. The horizontal flow in the rotating frame is measured using particle tracking. The steady state is well-described by an inertial mode whose amplitude is maximum when the height to diameter ratio is 0.995, which matches theoretical predictions. We also quantify the resonant amplitude of the inertial mode in the cylinder and estimate the amplitude in other devices. We compare our results to similar studies done in spherical devices. [Triana et al, JGR, 117 (2012), B04103][Boisson et al, EPL, 98 (2012), 59002]

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