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Undamped Nonequilibrium Dynamics of a Bose Gas in a 3D Isotropic Trap VICTOR COLUSSI, CAMERON STRAATSMA, DANA Z. ANDERSON, MURRAY HOLLAND, Department of Physics and JILA, University of Colorado, and NIST — In 1909 Boltzmann predicted a curious class of nonequilibrium solutions describing the undamped breathing mode oscillation of a 3D classical gas under isotropic harmonic confinement. His prediction and equation by the same name also famously predated the experimental confirmation of the existence of atoms. In the context of Bose gases in the ultracold regime, we investigate the possibility of studying such a nonequilibrium motion of the cloud persisting indefinitely throughout a range of temperatures above and below the transition and over a range of collisional regimes given a realistic trapping scenario. For a nondegenerate Bose gas, we characterize the emergence of anomalous damping in the breathing mode by modeling the influence of the trap anharmonicities via the joint mechanisms of dephasing and collisional relaxation. The model is tested using recent results from the JILA TOP trap experiment with a non degenerate cloud of Rb87 atoms. This work was supported by the U. S. National Science Foundation and AFSOR.

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