Parameter Sweep Report: Emergent Gravity from Quantum Collapse

Sweep results are saved in CSV file: param\_sweep\_results\_20250219\_133150.csv

# Parameter Ranges

collapse\_rates = [0.1, 0.3, 0.5]  
collapse\_sigmas = [0.1, 0.2]  
amplitudes = [0.5, 1.0]  
noise\_amplitudes = [0.005, 0.01]  
density\_decays = [0.99, 0.95]  
Fixed sim parameters: G=1.0, L=10.0, N=64, steps\_per\_cycle=50, num\_cycles=2, dt=0.05

# Results and Discussion

The parameter sweep systematically explores different combinations of collapse parameters. The noise spectrum slope (power-law exponent) is computed for each combination. A steeper negative slope (e.g., near -5) suggests that high-frequency fluctuations are strongly suppressed, which might indicate that the emergent gravitational potential is dominated by large-scale, coherent structures. Conversely, a shallower slope (e.g., near -1 or -2) would imply more small-scale noise. These results provide an independent quantitative signature that can eventually be compared with experimental data from short-range gravity tests or gravitational-wave detectors.

# Next Steps

1) Identify parameter combinations that consistently yield slopes near -5.  
2) Increase simulation resolution and number of cycles for robust statistics.  
3) Run control simulations with independently generated potentials to guard against circularity.  
4) Compare the predicted noise spectrum with experimental data from precision gravity experiments.