

# Material Limitations involving Nonlinear Damping

(Poster Presentation)

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## ABSTRACT

Common theories of mechanical oscillation assume that the dissipation mechanism(s) responsible for energy loss can be adequately approximated by linear differential equations. Failure to recognize the importance of nonlinear damping in a seismometer derive largely from the common, futile practice of 'comparing' theory with experiment in an overly narrow range of time and/or of energy. For example, a common error is to look at a short section of a free-decay record, and assume that the exponential which was chosen to fit the data actually makes sense. Though they would all look ostensibly reasonable; there are really a host of wrong fits to such a severely truncated record. Our obsession with exponential (linear) decay has prevented us from recognizing the critical importance of nonlinear internal friction at the mesoscale to a variety of important areas. For example, the noise source of greatest importance in our quest for better performance in the sub 1 mHz range is not electronics; rather it derives from mesoanelastic complexity of the seismometer spring (or other mechanical structures supporting the mass).