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Analysis of PDV velocity fluctuations in presence of phase transition for Bi and Ce¹ ROGER MINICH, RICKY CHAU, LLNL — Particle velocity fluctuations from PDV velocimetry of Bismuth and Cerium are analyzed to probe the dynamics of phase transitions in Bismuth and Cerium. Wavelet analysis is used to study the velocity dispersion as it evolves in time. Also, phase portraits, (parametric plots of particle acceleration versus particle velocity) are studied and results suggest that the phase transition behaves like a driven nonlinear dissipative dynamical system. An effective second order equation is extracted from the data. Surprisingly, the equation can be shown to be derived from the hydrodynamic equations when the bulk modulus has a dependence on the phase fraction. In addition, the velocity time history exhibits a discrete hopping between average velocity states reminiscent of a driven bistable oscillator. Finally, the phase portraits suggest how to study phase hysteresis scaling in real time.

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