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Particle Velocity Fluctuations and Pressure Induced Phase Transitions in Bismuth ROGER MINICH, FRED STREITZ, RICKY CHAU, DANIEL ORLIKOWSKI, LLNL — The dynamical behavior of a pressure induced phase transitions at high pressures is of current interest in high-pressure physics. It is known that hysteresis plays a major role in most rate driven phase transitions. The area and amplitude of the hysteretic cycle typically exhibit well defined scaling. We have studied the particle velocity correlations in Bismuth samples that have been shock loaded in plate impact experiments with pressures ranging from 3.1 - 14.4 GPa. The data show both global scaling of transition times with pressure as well as local scaling of fluctuation frequency with local average pressure. Using wavelet analysis and temporal autocorrelation functions, the analysis suggests that the phase transition proceeds by a sequence of hysteretic cycles. The onset of the new phase occurs when enough hysteretic cycles result in a sufficiently high phase fraction. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 Lawrence Livermore National Security, LLC.

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