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An Atomistic View of Isentropic Compression ANDREW HIGGINBOTHAM, GILES KIMMINAU, MATTHEW SUGGIT, JUSTIN WARK, University of Oxford, UK, EDUARDO BRINGA, Universidad Nacional de Cuyo, Mendoza, Argentina, NIGEL PARK, AWE, Aldermaston, UK, JAMES HAWRELIAK, JAIME MARIAN, EVAN REED, BRUCE REMINGTON, LLNL — A great deal of importance is currently being placed on the use of ramp compression to achieve quasi-isentropic compression of solids to multi-megabar pressures in experiments which are of interest in planetary science and inertial confinement fusion. However, there is still relatively little work addressing what is perhaps the most important issue in this field of study; what is the difference between a shock and an isentrope? This apparently simple question is well defined and understood in a thermodynamic sense, but in the case of real materials, where a number of complex mechanisms may contribute to heat production during compression, the picture is somewhat more complex. We will show results from a number of molecular dynamics simulations aimed at understanding the generation of heat, at the lattice level, during ramp compression. Contributions from both elastic and plastic work will be isolated, allowing us to gain a better understanding of the microscopic processes involved. In addition, large scale simulations of ramp compression will be presented, and the pertinent timescales for quasi-isentropic compression of elasto-plastic materials will be discussed.

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