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Inferring the equation of state of shocked liquid deuterium K. FALK, C.D. MURPHY, G. GREGORI, University of Oxford, S.P. REGAN, P.B. RADHA, T.R. BOEHLY, M.A. BARRIOS, D.E. FRATANDUONO, S.X. HU, University of Rochester/ LLE, D.O. GERICKE, J. VORBERGER, University of Warwick, S.H. GLENZER, D.G. HICKS, LLNL, GREGORI GROUP, OXFORD TEAM, LLE TEAM, GERICKE GROUP, WARWICK TEAM, LLNL COLLABORATION
— The equation of state of light elements is essential to understanding the structure of Jovian planets. Here we present a combination of experimental techniques used to characterize warm dense deuterium. The OMEGA laser was used to directly drive a shock wave in a planar liquid-deuterium target. The shocked D2 conditions were diagnosed using VISAR and pyrometry to obtain the shock velocity and temperature. Two shock waves were launched with velocities of 17±0.9 and 23±1.0 km/s, as a result of intensity variations in the staggered laser beam drive. Using a blackbody approximation, a temperature of 0.4 to 0.8 eV range was inferred. Various equation of state models including SESAME, PROPACEOS, DFT-MD and Saumon & Chabrier EOS were used to obtain a range pressures (0.4-0.5 Mbar) and densities (0.65-0.88 g/cc). Differences between models will be discussed. Preliminary data from X-ray scattering, providing a direct measurement of microscopic state of the deuterium for extreme conditions not accessible with VISAR, will also be presented.

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