Direct laser-driven quasi-isentropic compression studies of iron relevant for Earth-like planets interiors

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Abstract

The study of iron using quasi-isentropic compression yielding thermodynamical parameters different from those achieved on the principal Hugoniot might allow to access thermodynamic realm relevant for the understanding of the iron solid-liquid phase transition in the interiors of Earth and Earth-like planets (330-1500 GPa, 5000-8000K). However, the iron alpha-epsilon solid-solid phase transition at the pressure of 13 GPa favours shock formation during quasi-isentropic compression. Understanding this shock formation mechanism is crucial for reproducing Earth and Earth-like planets core conditions on

laboratories by ramp compression. Here we will present results of direct laser-driven quasi-isentropic compression experiments on iron samples. These experiments were performed on the LULI2000 laser facility and LIL. On one hand, different pressure ramp shapes, corresponding to different loading rates, were used to investigate the alpha-epsilon transition dynamics and on the other hand iron was ramp compressed until 700 GPa. Results will be presented and compared to simulations. The implication of these results for Earth-like planets characterisation will be discussed.