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WARM DENSE MATTER STUDIES RELEVANT FOR PLANETARY SCIENCE

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The study of planetary interiors is a key concern to provide a unified framework about planets' formation, evolution and structure. Today this purpose acquires new significance because of the active discovery of extrasolar planets. Planets of our Solar System are thus studied for both their specific interest and their role as better-known prototypes for classification and modelling of exoplanets. A major issue for this kind of study is represented by the substantial impossibility to directly probe the planets interiors. While the internal structure of our Earth can be inferred by means of analysis of seismic waves, for the other solar planets probing is limited to the surface (Mars) or even to a fly-by in the upper atmosphere (giant planets). In the last case, the only data in our possession are measurements of mass, magnetic and gravitational field, luminosity, radii etc.

Therefore, a model is needed to couple these observables in a self-consistent way with the interior structure and dynamics.

In this context, an accurate modelling requires a precise knowledge of structural and transport properties of some key elements (e.g. iron for our Earth), such as the equation-of-state, phase transitions, conductivity, etc. These properties at regimes typical of planetary interiors (few Mbar, few 1000 K) can today be measured in long pulse (ns) laser driven shock experiments. In this talk, we will present the experimental results that our group has obtained on key materials and will show the impact that they have on the planetary science.