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Planetary Implications of the Hugoniot of Liquid Deuterium D.D.

SASSELOV, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA 02138, W.J. NELLIS, Department of Physics, Harvard University, Cambridge MA — The question as to the correct Hugoniot of liquid deuterium has been resolved recently with high velocity impactors accelerated with hemispherically converging systems driven by high explosives and with planar systems driven by pulsed magnetic fields (1). Determination of this Hugoniot has a significant influence on the equation of state of dense fluid hydrogen, which in turn constrains models of the interiors of Jupiter and Saturn, as well as extrasolar giant gas planets (2). Prior to these measurements there was considerable uncertainty as to the size of Jupiters core and the amount of metals (oxygen, carbon, nitrogen, etc) mixed throughout its H-He envelope. A principal result of these Hugoniot measurements is to demonstrate that Jupiter has a small rocky core and a substantial amount of metals dissolved throughout its H-He envelop. A more general effect is to show that most giant planets appear to be similar to this picture of Jupiter, which in turn identifies unusual giant planets for further study.

(1) G. V. Boriskov et al, *Phys. Rev. B* **71**, 092104 (2005).

(2) M. Konacki et al, *ApJ*. **624**, 372 (2005).

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