Abstract Submitted
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Characterization of Jupiter's Interior with First Principles Computer Simulations BURKHARD MILITZER, JAN VORBERGER, Carnegie Institution of Washington, WILLIAM HUBBARD, University of Arizona — We report results from recent investigations of the interior structures of Jupiter using density-functional molecular dynamics (DFT) simulations of dense fluid hydrogen-helium mixtures [1]. The equation of state (EOS) is derived on a grid of temperature and density points spanning Jupiter's interiors. The properties of both fluids in dynamic shock compression experiments are compared [2]. Based on the DFT-EOS, we derive models for the interior of giant planets. Our models update the suite of models that were based on the widely used Saumon-Chabrier-Van Horn (SCVH) EOS. Unlike SCVH, the computed DFT-EOS does not predict any first-order thermodynamic discontinuities associated with pressure-dissociation and metallization of hydrogen. Deviations of the DFT-EOS from SCVH are up to about +/- 5% depending on the pressure. As a result our models predict a significantly larger rocky core for Jupiter than SCVH. We will discuss inferred core mass and make predictions for properties of core. [1] J. Vorberger, I. Tamblyn, B. Militzer, S.A. Bonev, "Hydrogen-Helium Mixtures in the Interiors of Giant Planets," cond-mat/0609476. [2] B. Militzer, PRL 97 (2006) 175501. Supported by NASA PGG04-0000-0116 and NSF Grant 0507321.

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