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Models of Giant Planet Interiors Derived from First-Principles Simulation BURKHARD MILITZER, UC Berkeley, JAN VORBERGER, University of Warwick, WILLIAM HUBBARD, University of Arizona — Our understanding of the interior of giant planets is based on the accurate characterization of hydrogen and helium at megabar pressures and temperatures of several thousands of Kelvin. Theoretical method including first-principles computer simulations have been the preferred tool to study these dense fluids because laboratory experiments cannot yet probe deep into Jupiter's interior despite great progress in shock wave measurements with precompressed samples. Results from an extensive set of density-functional molecular dynamics simulations will be presented [J. Vorberger *et al.,* "Hydrogen-Helium Mixtures in the Interiors of Giant Planets," *Phys. Rev. B* **75** (2006) 024206]. A new and more accurate equation of state (EOS) will be derived that spans the interior of giant planets. Differences from the widely used Saumon-Chabrier-Van Horn (SCVH) EOS will be analyzed. An updated model for the interior of Jupiter will be introduced. Estimates for the heavy element enrichment as well as for the size of Jupiter's core will be discussed and compared with previous models based on the SCVH EOS. This work is supported by NASA grants PGG04-0000-0116 and NAG5-13775 as well as NSF grant 0507321.

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