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Experimental evidence for phase separation in hydrogen-helium mixtures at Jovian planet conditions[1] G.W. COLLINS, Lawrence Livermore National Lab, S. BRYGOO, Departement de Physique Theorique et Applications, CEA, M. MILLOT, J.R. RYGG, P.M. CELLIERS, J. EGGERT, Lawrence Livermore National Lab, T.R. BOEHLY, Laboratory for Laser Energetics, University of Rochester, R. JEANLOZ, Department of Earth and Planetary Science, University of California, Berkeley, P. LOUBEYRE, Departement de Physique Theorique et Applications, CEA — Whether or not H-He mixtures phase separate in Jovian planets is important to our understanding of the structure and evolution of Jupiter and Saturn. Also integral to such planet models, as well as mechanisms for H-He phase separation, are the insulating-to-conducting and the molecular-to-atomic-hydrogen transitions in the H-He mixture. Coupling static and dynamic compression techniques has allowed us to make the first thermodynamic and transport measurements of H-He mixtures at deep Jovian planet conditions. These data provide evidence that the H-He fluid demixes at the high pressures and temperatures expected to exist deep inside Saturn and Jupiter. This phase separation may result in the differentiation of heavier helium clusters, leading to helium rain in the deep interior of Saturn and perhaps even in a significant outer layer of Jupiter.

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