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An Experimental Study of Turbulent Boundary Layers in Free-Surface MHD Flows J. LUC PETERSON, MARK NORNBERG, HANTAO JI, ALEX GILL, Princeton University, DIMITRIS GIANNAKIS, University of Chicago — Descriptions of the turbulent boundary layers in astrophysical and laboratory plasmas require an understanding of free-surface magnetohydrodynamic (MHD) stability. The dynamics of the plasma ocean on the surface of nuetron stars in binary systems could relate to X-Ray burst phenomena, while turbulent flows in liquid metal diverters are useful for effective heat transport from the core of a fusion reactor. The Liquid Metal eXperiment (LMX) at PPPL is a small-scale laboratory experiment using liquid gallium alloy designed to study free-surface MHD stability and wave propagation. LMX is a short wide-aspect ratio channel (1 by 15 by 70 cm) designed for Reynolds numbers of 10000 under an imposed magnetic field of 7 kG. Extensive hydrodynamic experiments have demonstrated the ability to create stable turbulent boundary layers in short open channels. The transition to liquid metal operations will be discussed, with particular attention paid to new flow velocity diagnoistic tools and techniques for creating stable turbulent boundary layers. This work supported by DoE under contract #DE-AC02-76- CH03073.

Jayson Luc Peterson
Princeton University

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