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Heat transfer in free-surface, flowing liquid metal[1] J. RHOADS, Princeton University, E. SPENCE, E. EDLUND, P. SLOBODA, H. JI, PPPL — The presence of a strong external magnetic field affects structures within the flow of conducting fluids such as liquid metals, which may have significant implications for thermal convection in proposed liquid-metal divertor concepts. Experiments have been conducted in the Liquid Metal Experiment (LMX) using a GaInSn eutectic alloy as a working fluid to investigate the anisotropization due to the magnetic field on turbulent structures in the flow and the resulting effects on convective heat transfer. These experiments considered free-surface, wide aspect-ratio flow through a channel situated in a magnetic field (up to Ha $\approx$ 50). Heat was injected into the fluid via resistive heaters located either on the surface or submerged in the fluid. The thermal profile was tracked on the surface of the flow by a mid-wavelength IR camera and at the bottom of the flow by a dense array of fine gage thermocouples. Along with internal velocity measurements, the temporal and spatial thermal profiles show the effects of the magnetic field on convection, yielding valuable insight into the behavior of heat transfer in free-surface, liquid metal flows. Experimental results and proposed explanations will be presented.

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