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Convection-driven melting in an n-octane pool fire bounded by an ice wall HAMED FARMAHINI FARAHANI, Worcester Polytechnic Institute, ULISES ALVA, University of Edinburgh, ALI RANGWALA, Worcester Polytechnic Institute, GRUNDE JOMAAS, University of Edinburgh — Burning of the liquid fuels adjacent to ice bodies creates a lateral cavity due to melting of the ice. The formation of lateral cavities are noticed recently and only a few experimental studies have addressed them. One study has shown lateral cavity formation with length of 12 cm for 5 minutes burning of oil. Based on the hypothesis that melting is facilitated by the convection in the liquid fuel, a series of PIV tests were conducted on burning of n-octane in a square glass tray with a 3 cm thick ice wall placed on one side of the tray. Marangoni generates a flow below the surface of the fuel and near the ice from hot to cold regions. The flow measurements by a 2D PIV system indicated the existence of different flow regimes. Before ignition, combined surface tension and buoyancy effects led to a one roll structure. After ignition the flow field began transitioning toward an unstable regime with an increase in velocity magnitude. Unfortunately, the PIV quality declined in the unstable regime, but indications of a multi-roll structure separating from a primary horizontal flow on the top driven by Marangoni convection were observed. The knowledge gained from these experiments will help determine the influential parameters in ice melting during burning of oil in ice-infested waters.

Hamed Farmahini Farahani
Worcester Polytechnic Institute

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