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Numerical simulation of a liquid-metal circular hydraulic jump using a level-set method THOMAS SCHMIDT, ANDREAS CLASS, Forschungszentum Karlsruhe, PAUL NEITZEL, Georgia Tech — New reactor concepts (e.g., Accelerator-Driven Systems) that utilize the impact of a high-energy particle beam onto a liquid-metal surface have driven the need for improved predictive techniques for high-speed flows of high-surface-tension liquid metals. We study here the flow in a liquid-metal circular hydraulic jump (CHJ), to compare the predicted results with those from a companion experimental investigation. The flow differs from the traditional CHJ in that outflow over the weir is confined to a few discrete locations in the experimental protocol. The level-set method was employed for numerical simulations. Theoretically, the height of the CHJ and a height correction at the weir were obtained through balancing surface-tension and gravitational forces using the Young-Laplace equation for a static situation. Results are in good agreement with experiment, including the numerical prediction of "fingering" in the flow upstream of the jump under certain wettability and flow conditions.

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