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A Combined Lagrangian-Thin Film Model for Investigating Film to Rivulet Transition on Surfaces with Various Wettabilities MOUSSA TEMBELY, IAN DIZON, ALI DOLATABADI, Concordia University — Understanding rivulet formation which arises from cloud droplets impact is of interest for the aerospace industry, where in icing conditions rivulets and droplets run back along the aerodynamics surfaces. In the present work, a numerical model based on a coupling between a Lagrangian method for spray generation and thin film approach is used to investigate the rivulet formation on various surfaces. The thin-film approximation which results from the simplification of the Navier-Stokes equations accounts for the surface wettability through a contact line force model which enables to describe film-to-rivulet transition and film separation. After validating the thin film model with a Nusselt solution of a steady state laminar flow over a vertical plate, the transition from spray to rivulet is simulated on a cylinder with 3 wettabilities: hydrophilic, hydrophobic and superhydrophobic. The spray impingement on the cylinder is carried out in 2 configurations (i) vertical where a gravity-driven rivulet is formed on the cylinder side, and (ii) horizontal where the spray impacts on the cylinder under the effect of airflow. In addition to the simulations, these two configurations are investigated experimentally using a high speed camera and a small scale icing wind tunnel

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