Abstract Submitted
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An Experimental Investigation on the Wind-Driven Water Film Flows over Rough Arrays by using a Digital Image Projection (DIP) Technique[1] KAI ZHANG, ALRIC ROTHMAYER, HUI HU, Iowa State University, IOWA STATE UNIVERSITY TEAM — In the present study, an experimental investigation was conducted to quantify the transient behavior of the wind-driven surface water film flows over a rouged surface in order to examine the water mass trapped effect due to the presence of roughness arrays pertinent to aircraft icing phenomena. A novel digital image projection (DIP) technique was developed and applied to achieve time-resolved measurements of the thickness distributions of the unsteady surface water film flows over the roughness arrays, in comparison with those over a flat plate as the comparison baselines. The measurement results reveal clearly that, at relatively low wind speed, the roughness arrays would perform as a dam to block the wind-driven water film flow at the front side of the roughness arrays. For the cases with relatively high wind speeds, the trapped water mass was found to stagnate mainly at the backside of the roughness arrays. The time-averaged mass trapping ratio was found to be very sensitive to the wind speed, but less sensitive to the flow rate of the surface water film flows over the test plate.

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