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Scaling Laws for Inter-droplet Ice Bridging SAURABH NATH, FARZAD AHMADI, JONATHAN BOREYKO, Virginia Tech — In this work, we study the dynamics of an ice bridge growing from a frozen droplet towards its neighboring supercooled liquid droplet. Experiments were done on a Peltier stage inside a humidity chamber with deposited or condensed droplets where the substrate temperature and ambient humidity could be controlled. Following a quasi-steady diffusion-driven model, we develop scaling laws to show how the growth rate depends on the substrate temperature, droplet sizes and inter-droplet distances over and above other environmental parameters such as air temperature and humidity. The growth rate as well as the success or failure of an ice bridge to connect to its neighboring liquid droplet depend on a nondimensional number called the separation parameter S^*, defined as the ratio of the initial inter-droplet spacing to the diameter of the evaporating liquid droplet. It is shown that the maximum value of S^* for connection scales as 1 as long as frozen drop is larger than the liquid droplet. For the converse case of a larger water drop, there are at least three separate regimes of critical S^*, depending on whether the water drop is a puddle, a spherical cap or if the frozen drop is a puddle.

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