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Dry Zones Around Frozen Droplets CAITLIN BISBANO, SAURABH NATH, JONATHAN BOREYKO, Virginia Tech, NATURE-INSPIRED FLUIDS AND INTERFACES TEAM — The saturation pressure of water vapor above supercooled water exceeds that above ice at the same temperature. A frozen droplet will therefore grow by harvesting water vapor from neighboring supercooled condensate, which has recently been demonstrated to be a primary mechanism of in-plane frost growth on hydrophobic surfaces. The underlying physics of this source-sink interaction is still poorly understood. In this work, a deposited water droplet is frozen on a dry hydrophobic surface initially held above the dew point. We demonstrate that when the surface is then cooled beneath the dew point, the frozen droplet harvests nearby water vapor in the air. This results in an annular dry zone that forms between the frozen droplet and the forming supercooled condensation. For a given ambient temperature and humidity, the length of the dry zone varied strongly with surface temperature and weakly with droplet volume. The dependence of the dry zone on surface temperature is due to the fact that the vapor pressure gradients between the ambient and the surface and between the liquid and frozen water are both functions of temperature.

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