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Frost flowers[1] GRAE WORSTER, ROBERT STYLE, Institute of Theoretical Geophysics, DAMTP, University of Cambridge — Frost flowers are dendritic or rod-like ice crystals found on young sea ice. Given that sea ice is briny and that frost flowers grown in the laboratory had seemed to be associated with a salty slush layer on the surface, it has been thought that brine transport through the porous sea ice is a prerequisite for frost-flower formation. Additionally, reported experiments in which frost flowers were grown in the laboratory have involved an external vapour source, suggesting further that frost flowers condense from a saturated atmosphere in the same way as hoar frost. We have determined a regime diagram of external temperature and humidity showing the conditions under which an ice surface will evaporate (sublimate) or grow by condensation and the conditions under which supersaturation occurs local to the ice surface. This shows that frost flowers can grow into a relatively dry atmosphere while the underlying ice surface is evaporating and also that frost flowers can grow on a pure ice surface. We have confirmed these results with laboratory experiments and evaluated linear and nonlinear stability analyses to elucidate the initial formation of frost flowers further.

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