

Frost propagation on breath figures

D. Paulovics¹, C. Raufaste^{1,2}, T. Frisch¹, C. Claudet¹, F. Celestini¹

1: Université Côte d'Azur, CNRS, Institut de Physique de Nice (INPHYNI), 06100 Nice

2: Institut Universitaire de France, 75005 Paris

• Examples



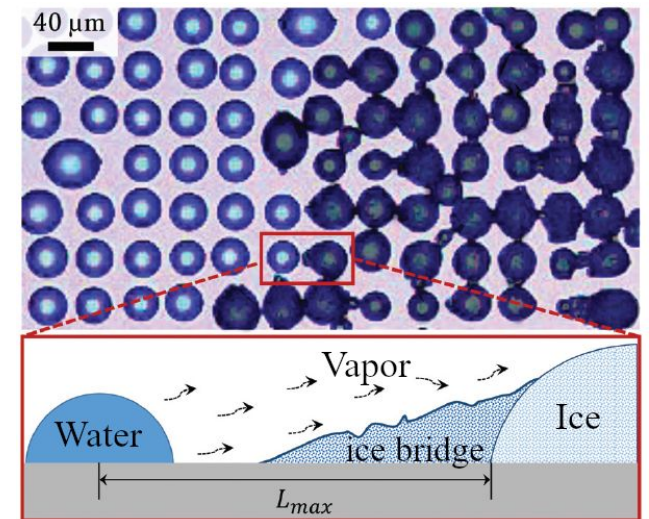
Frost accretion on an airplane



Icy refrigerator

- Condensation frosting: solidification of an assembly of supercooled water droplets
- A 3-phases mechanism: formation of ice bridges from solid to liquid drops
- Ice bridging velocity 1-10 $\mu\text{m/s}$ for micrometric drops

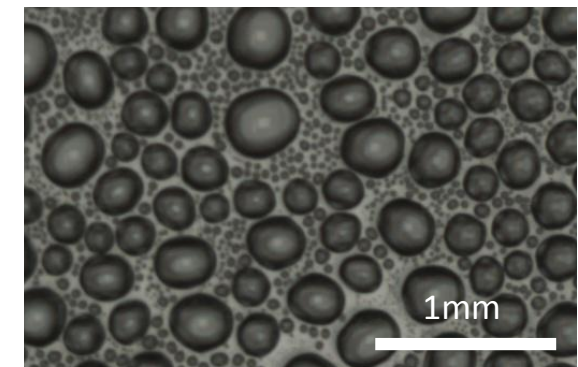
Boreyko et al., *Soft Matter* 2018



Originality of the work

- real conditions
 - polydisperse size distribution
 - “everyday” surfaces
- infrared microscopy

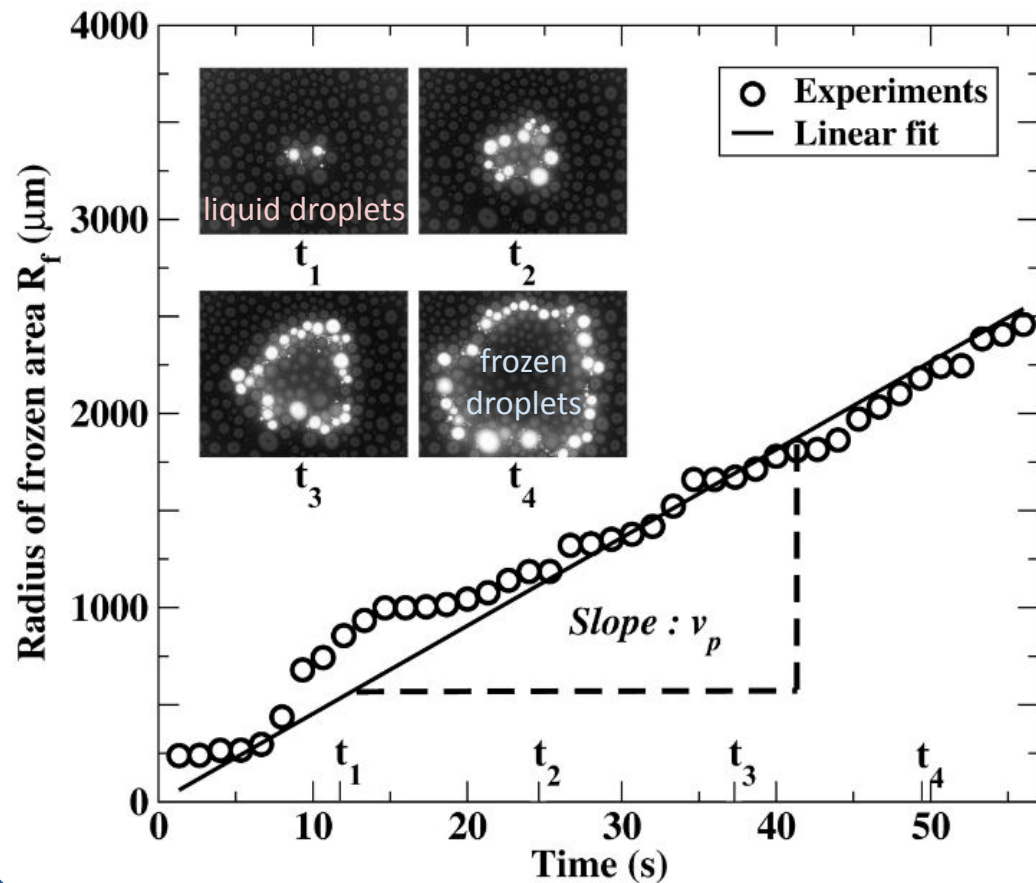
a polydisperse size distribution



Main result: percolation front speed

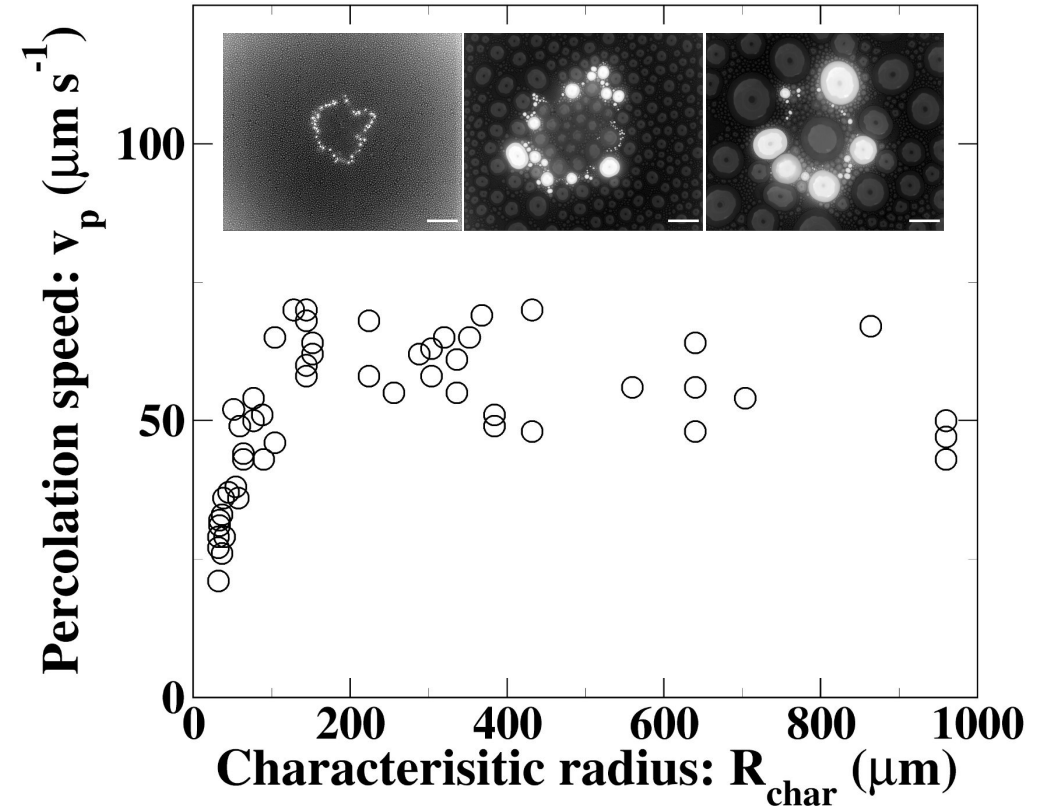
Frost front followed by infrared microscopy

- R_f : radius of the frozen region
- R_f increases linearly with time
- the percolation front velocity v_p is constant



Effect of the size distribution

- v_p as a function of R_{char} (typical droplet radius)
- non trivial trend, presence of a maximum



- model: coupling ice bridging and single drop freezing
 - article: Paulovics et al, Langmuir 2022
- Dynamics of Frost Propagation on Breath Figures