

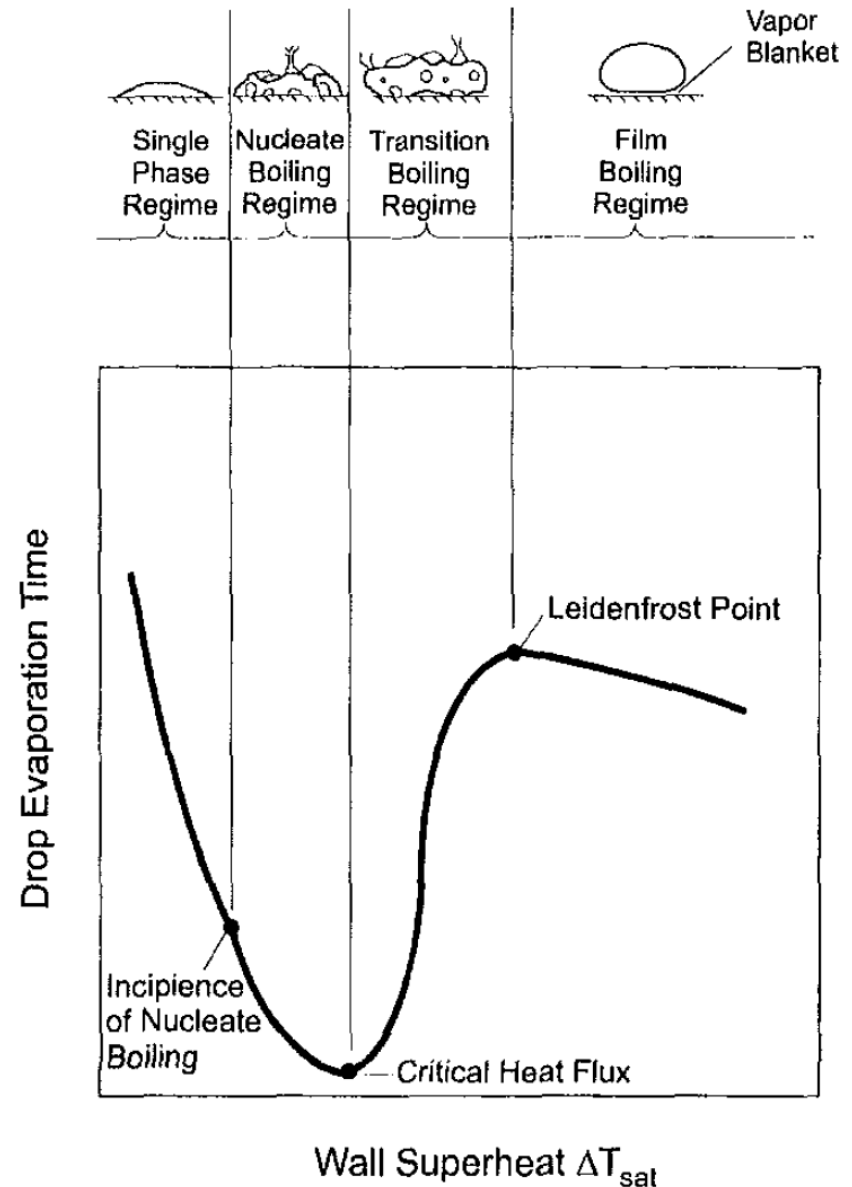


Looking under Leidenfrost Drops

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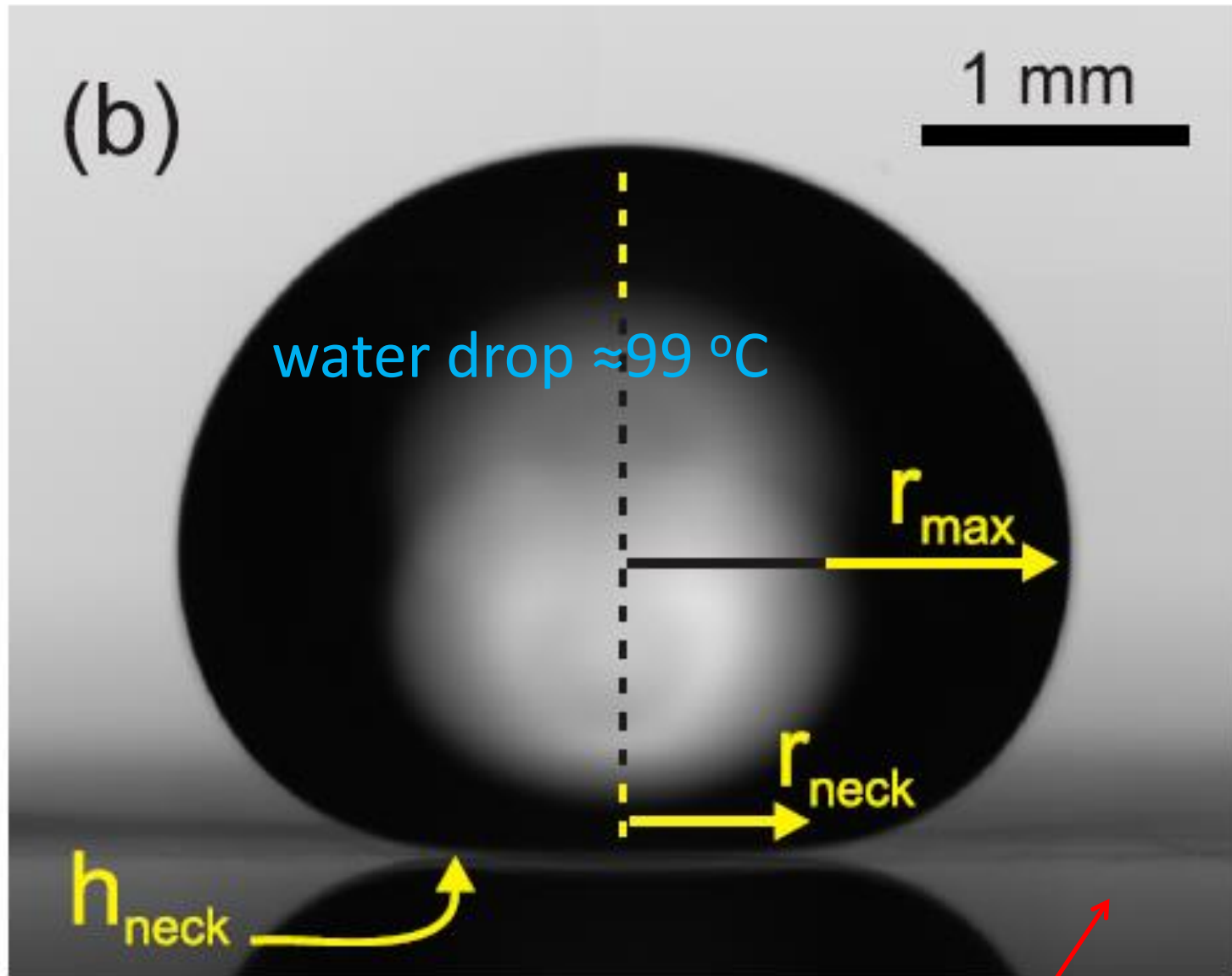


- Liquids can't cool surfaces at large ΔT
- Insulating vapor layer forms at the interface
- Drops deposited on hot surface will levitate



Bernardin, Mudawar, J. Heat Transfer (1999).

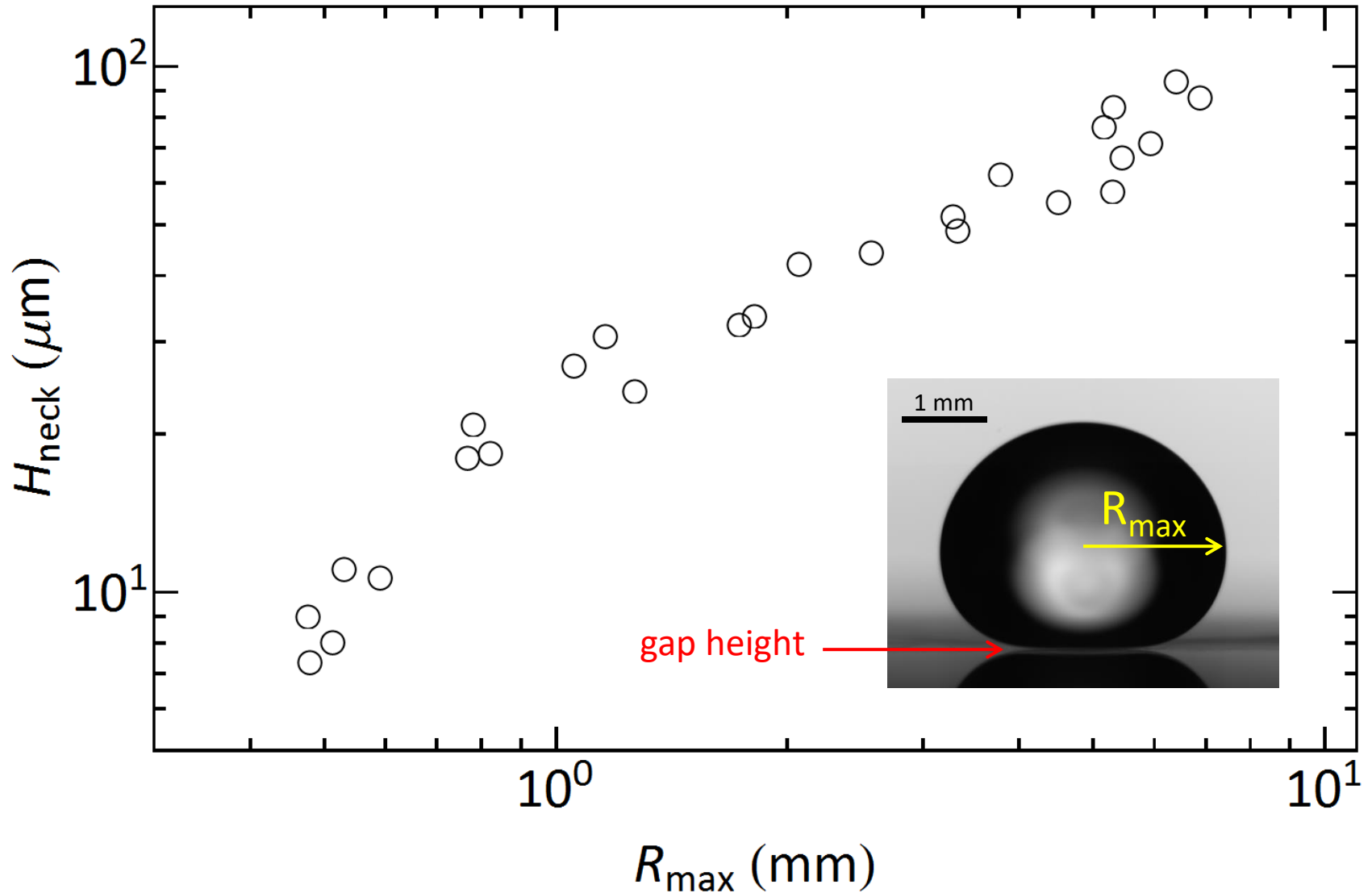
Structure of drop



370 °C aluminum

Distance from Surface

370 °C

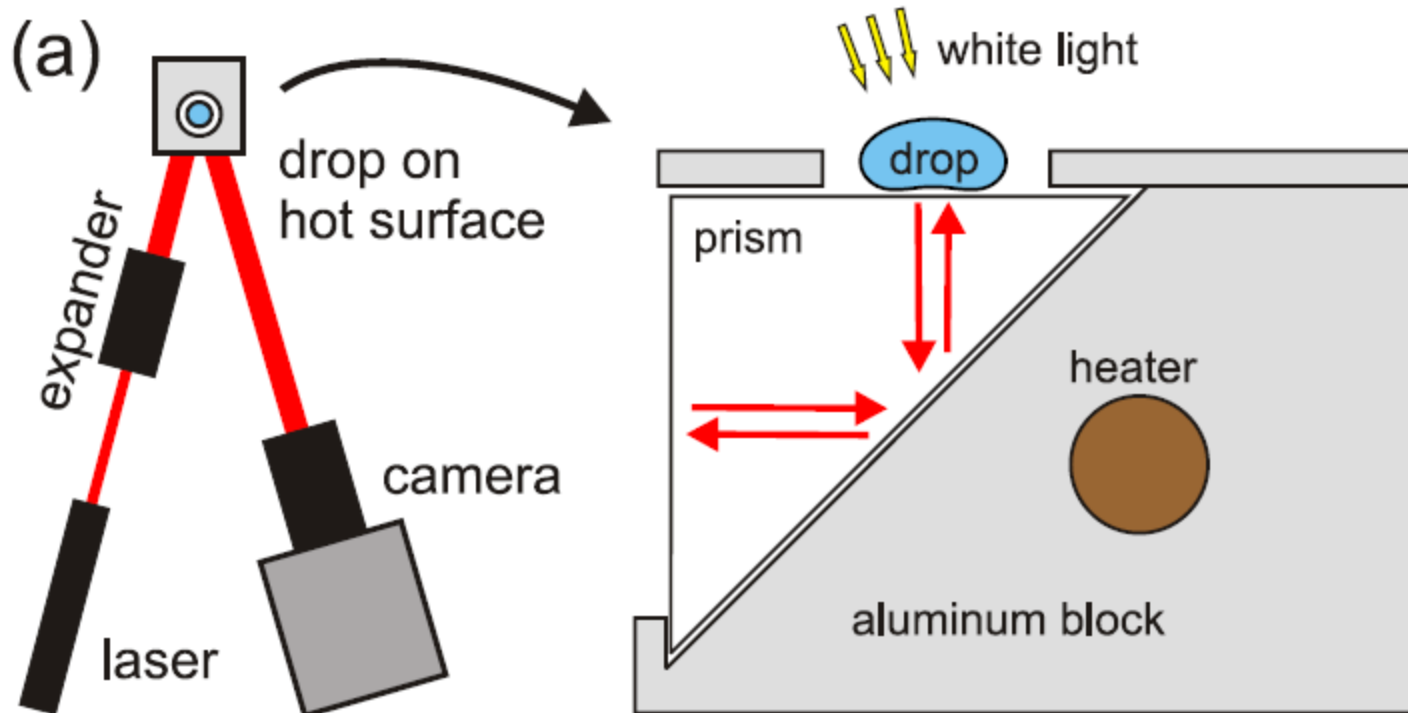


Characterizing the Vapor Film

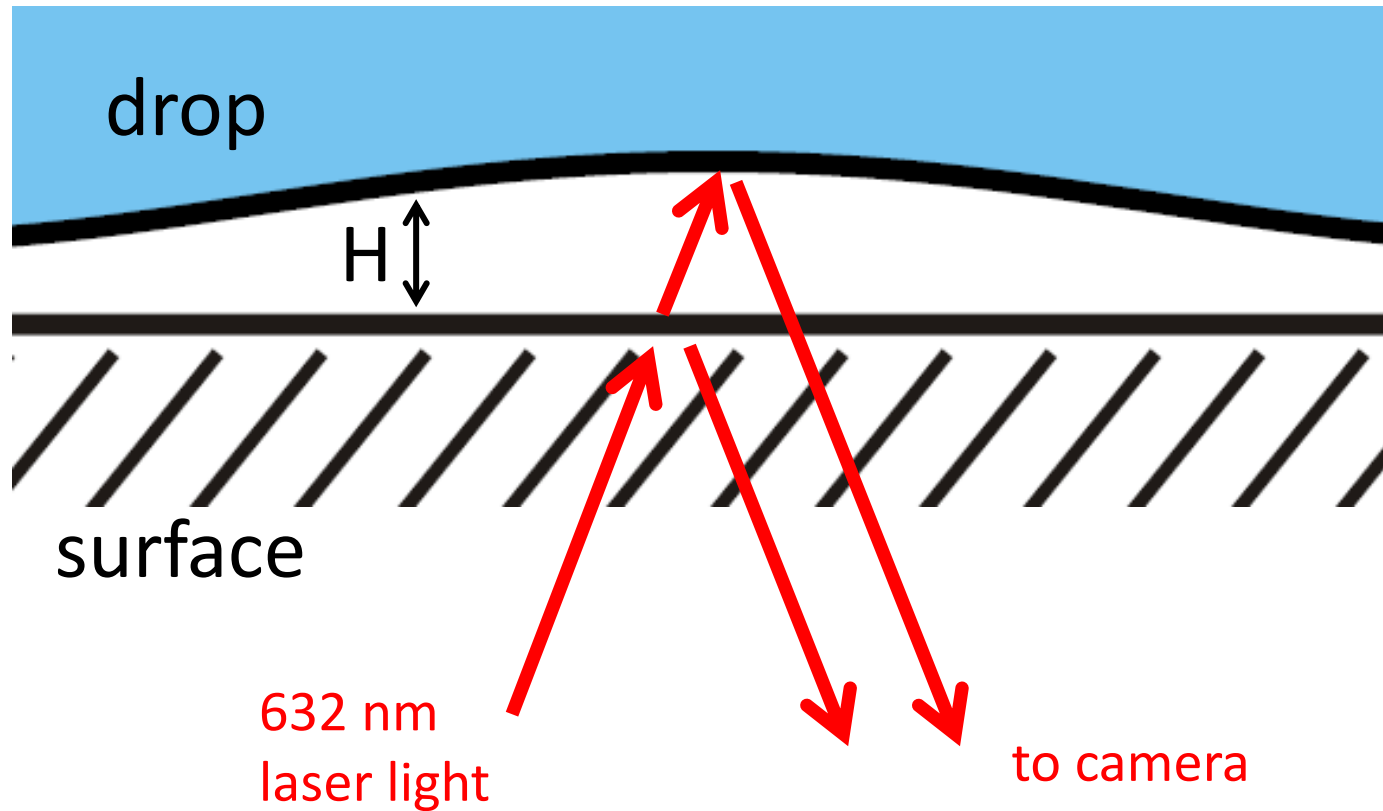
- Topology of bottom of drop
- Height of neck
- Height to top of air pocket
- Changes with time and drop size
- Temperature dependence

Ultrafast Interference Imaging from Below

Driscoll, Nagel, PRL (2011).

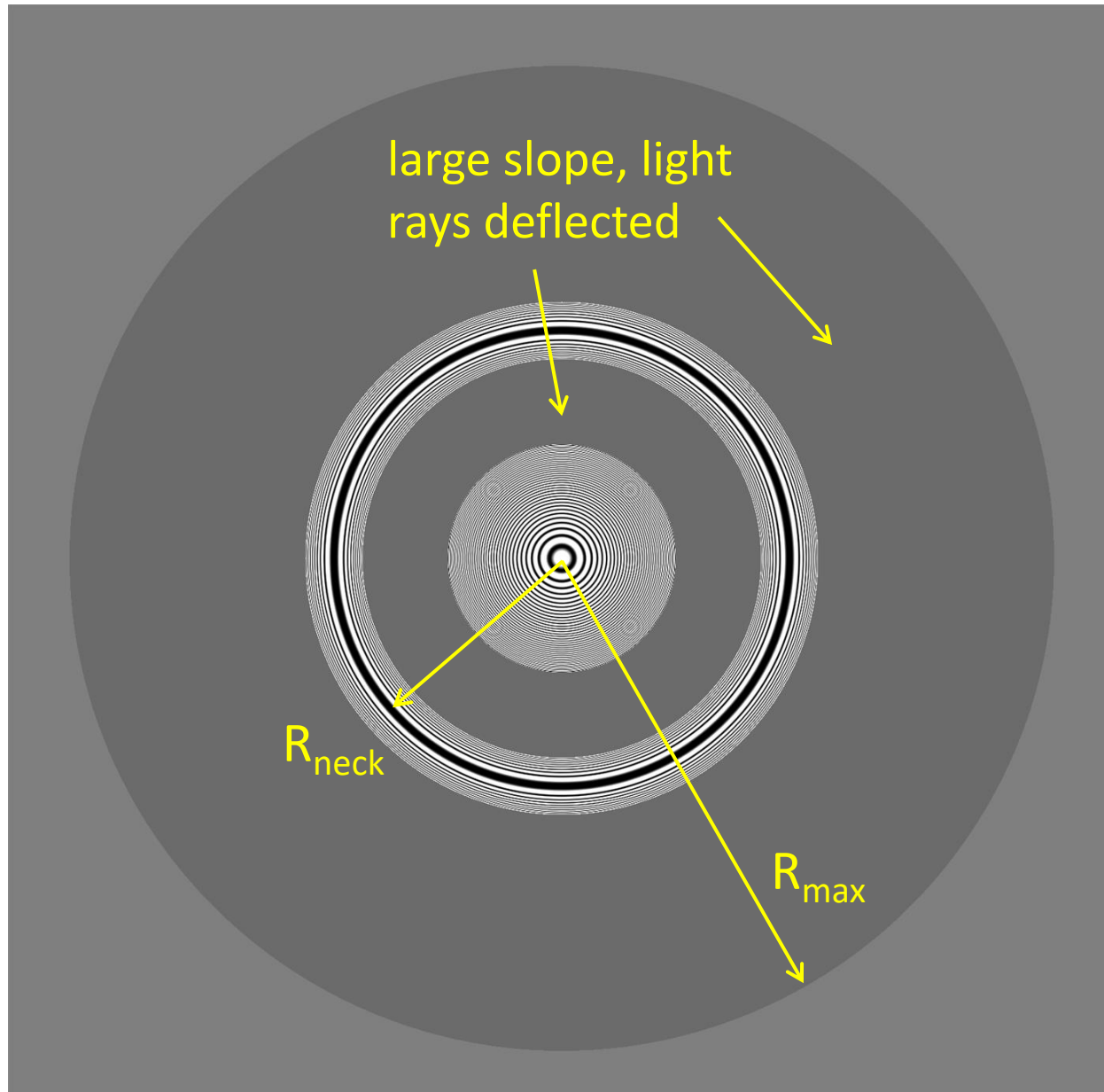


Light Interference

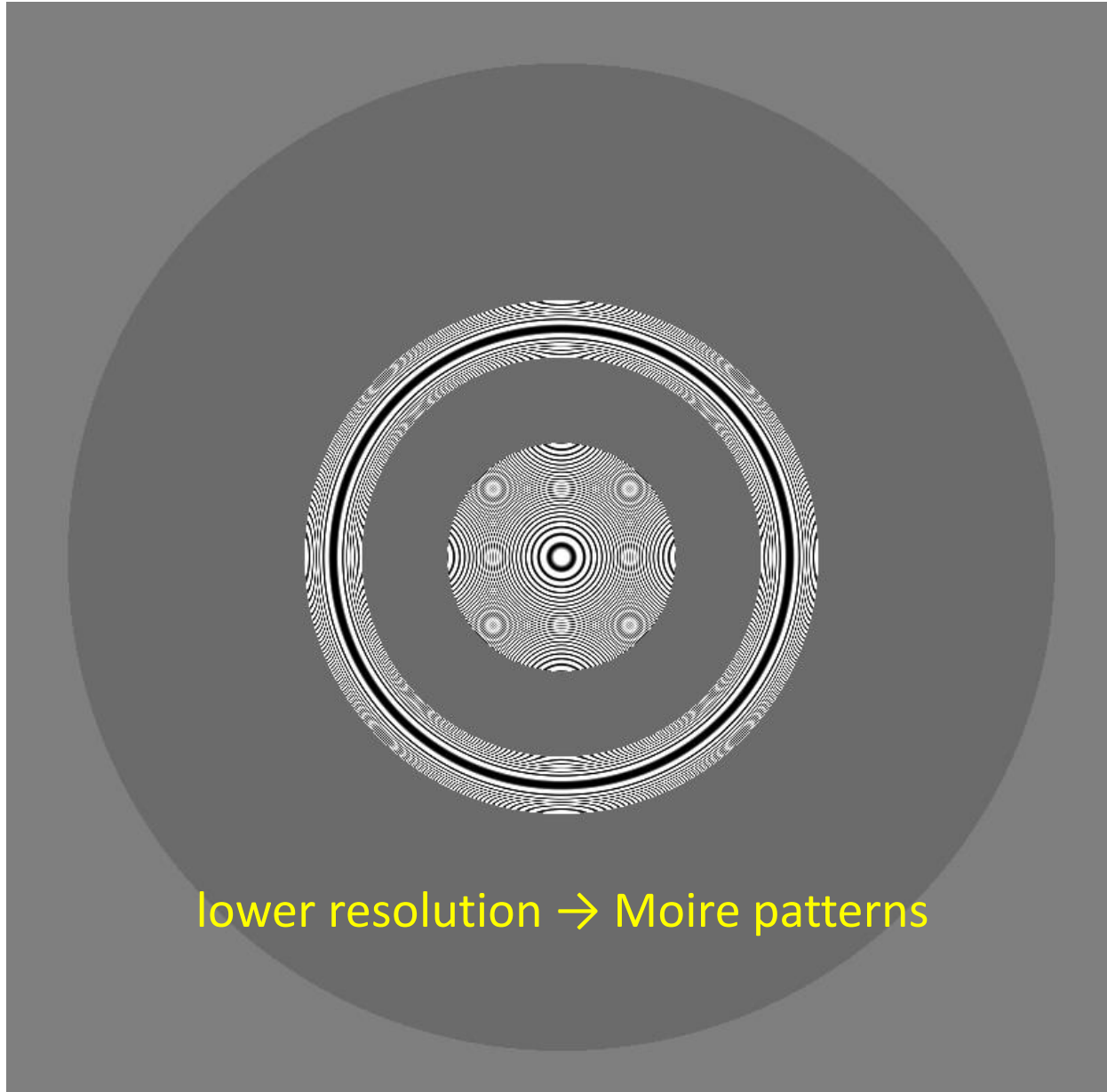


$$\text{intensity} \propto \sin^2 \left(\frac{2\pi H}{\lambda} \right)$$

Expected Pattern From Below

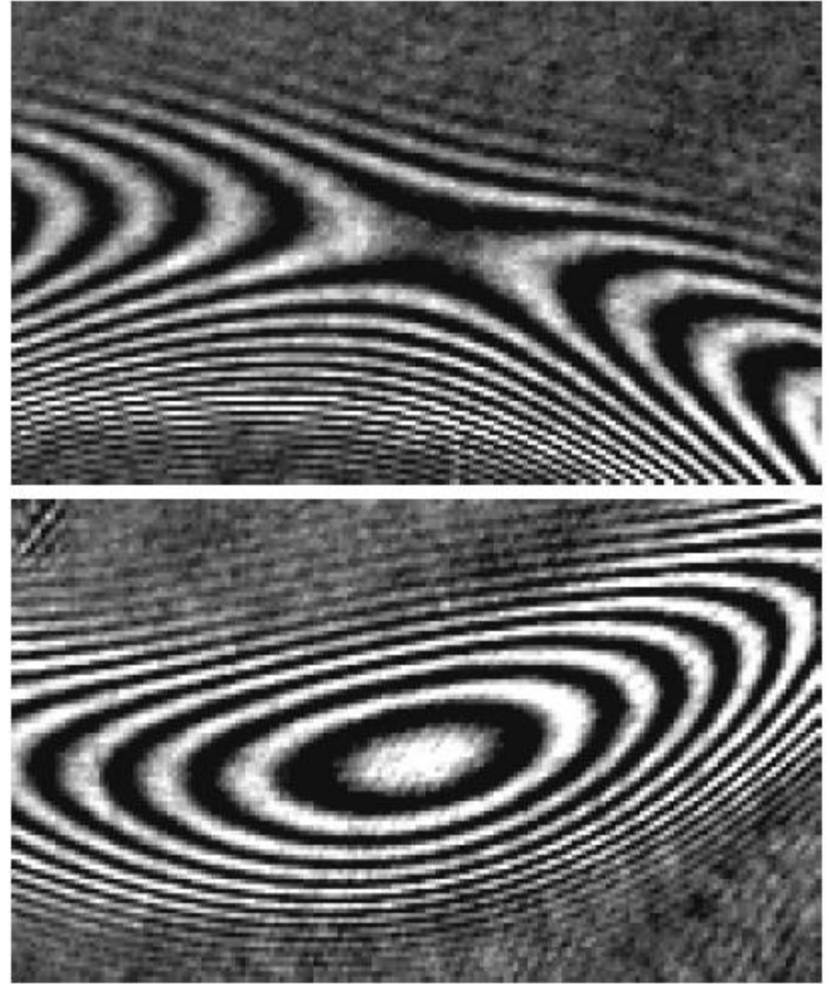
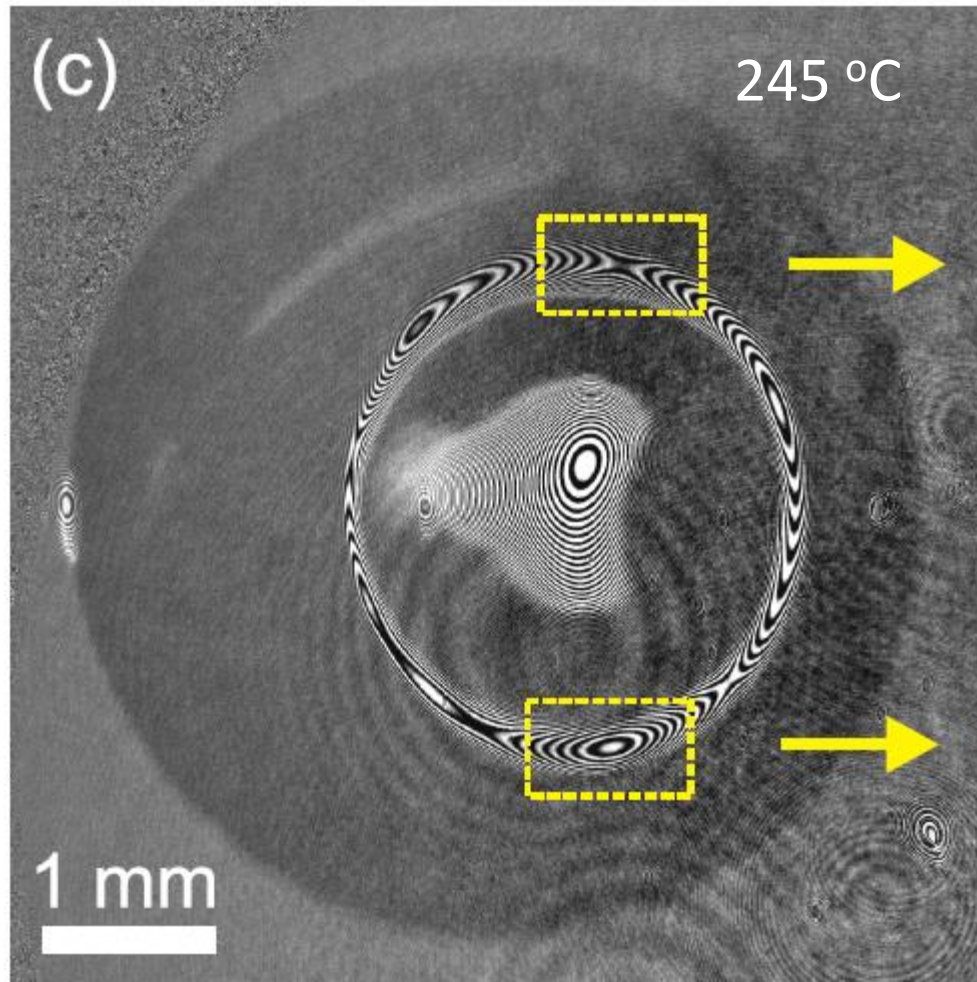


Expected Pattern From Below

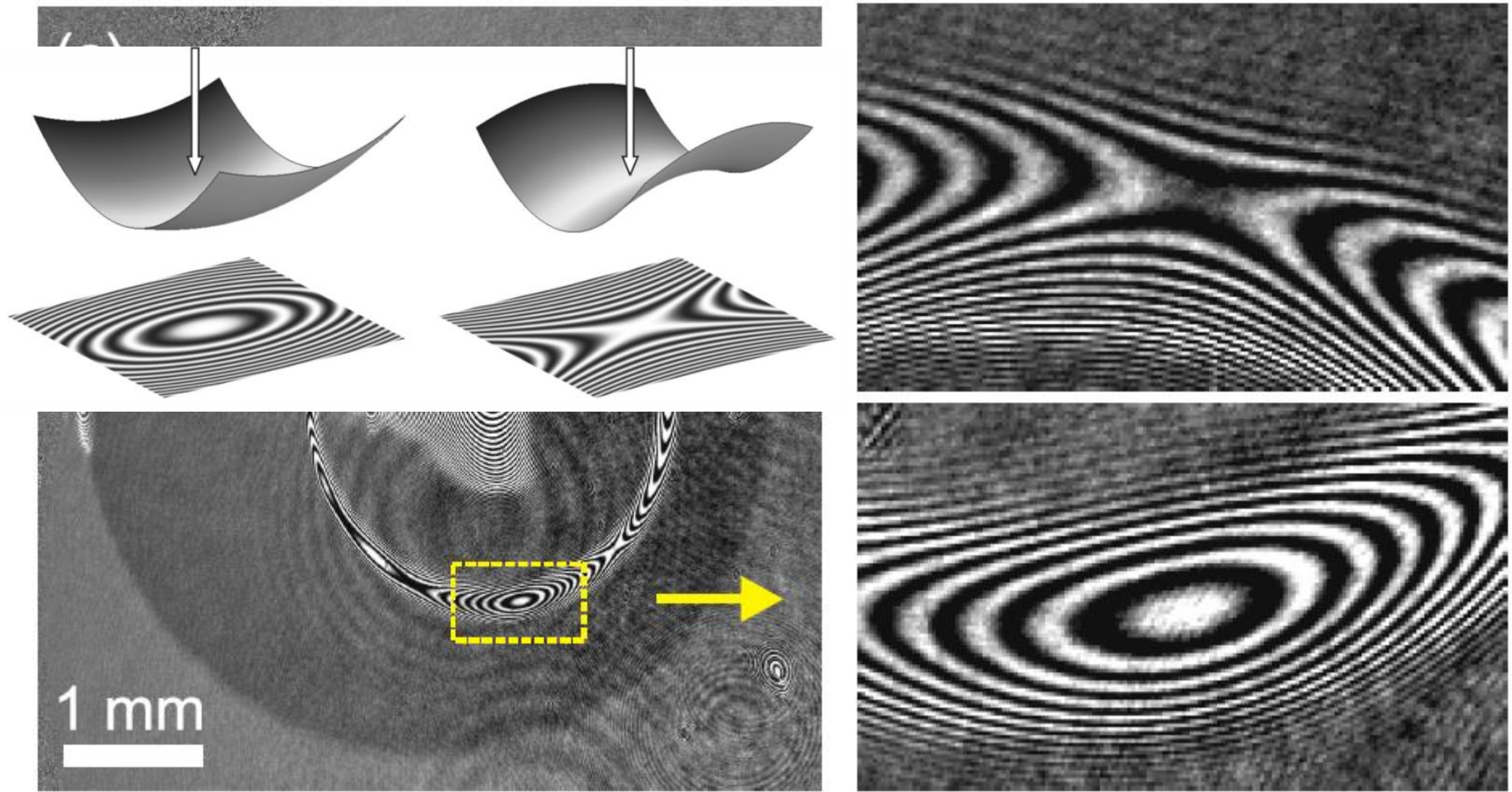


lower resolution → Moire patterns

Underneath a Water Drop



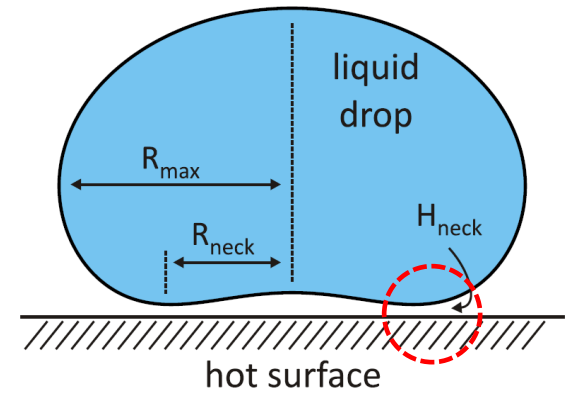
Underneath a Water Drop



Possible Experimental Measurements

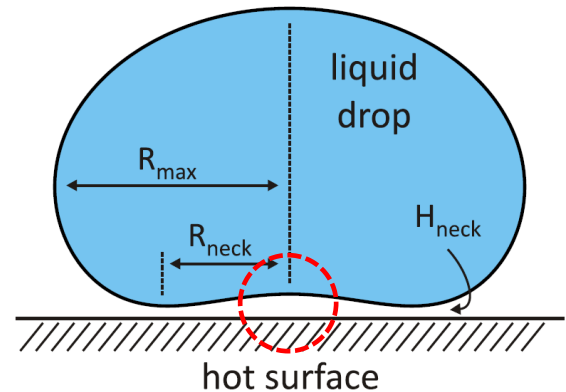
Neck Region:

- neck radius
- neck curvature
- fluctuations

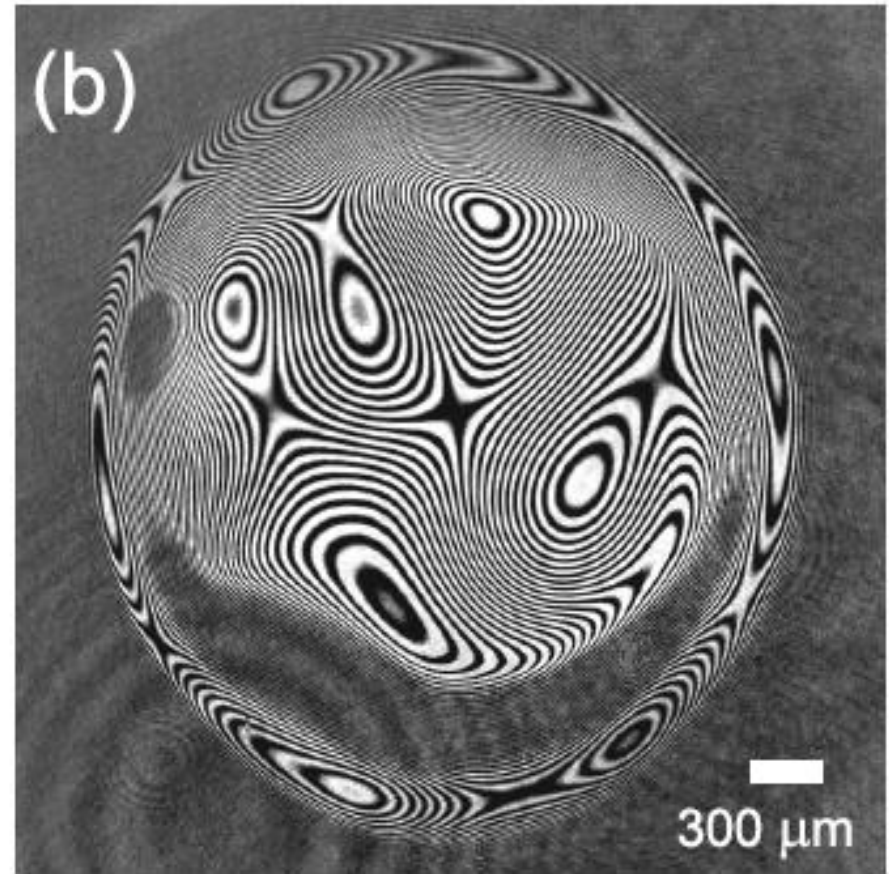
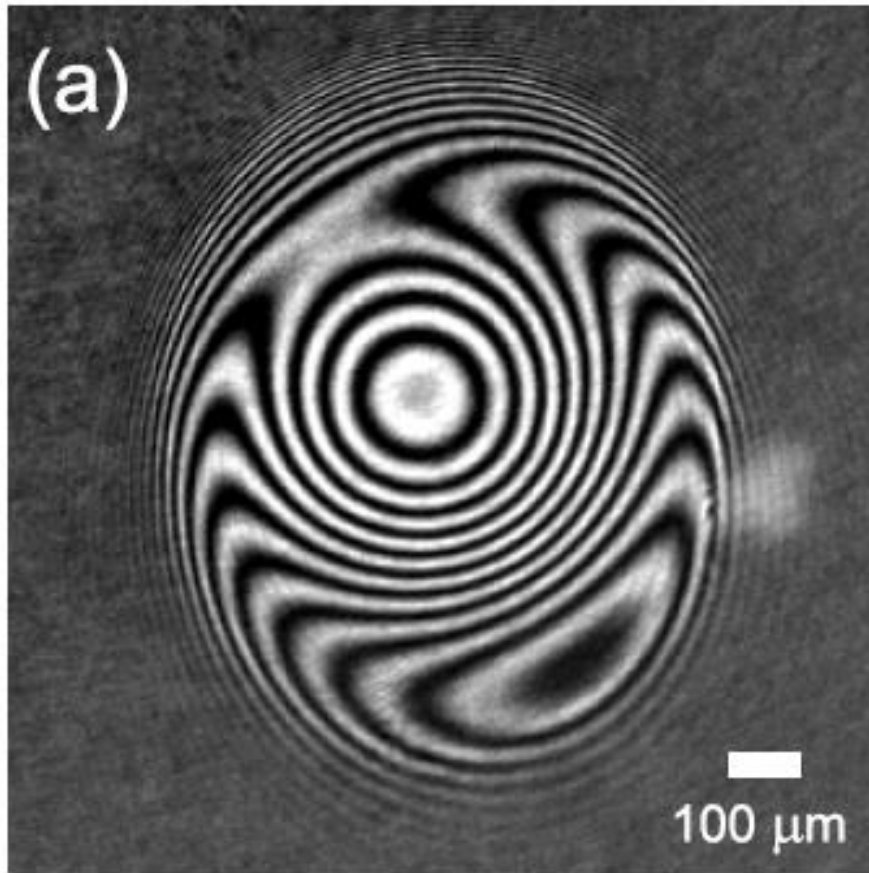


Center Region:

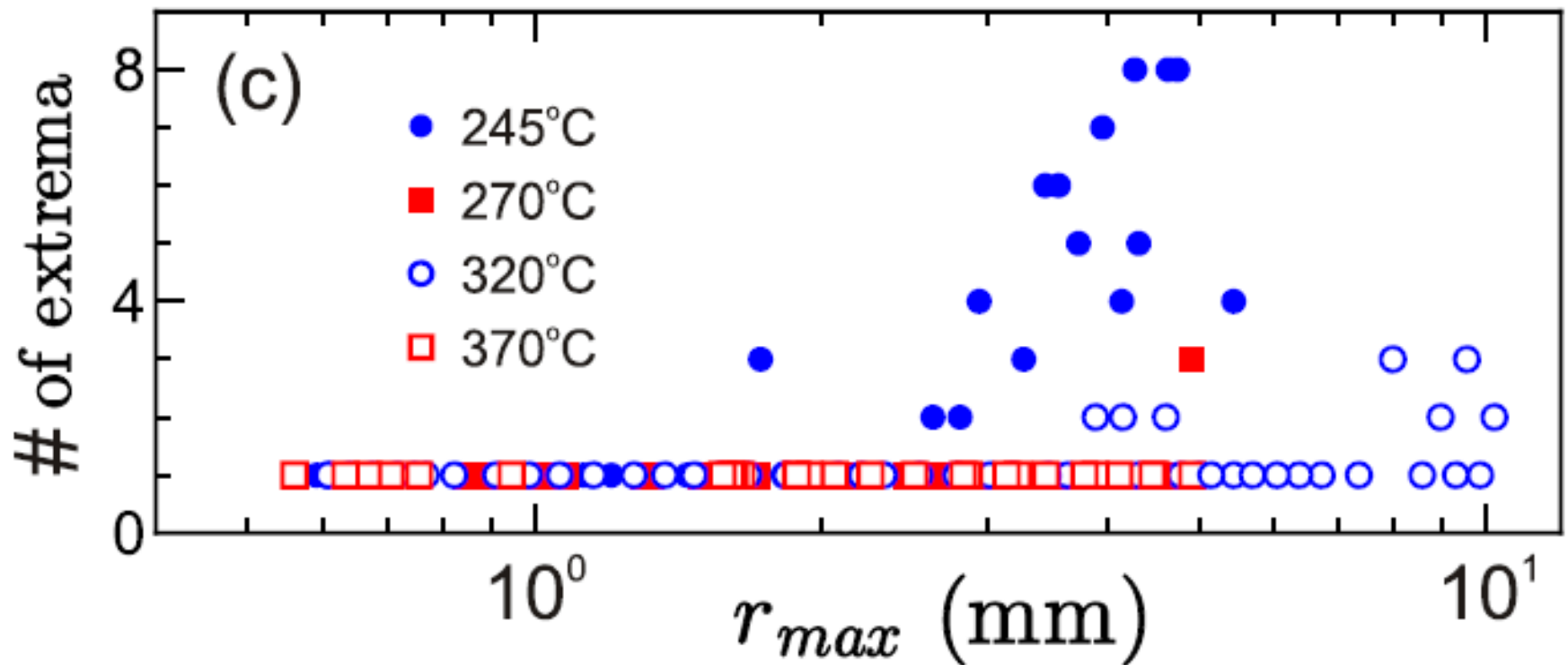
- curvature of center
- fluctuations



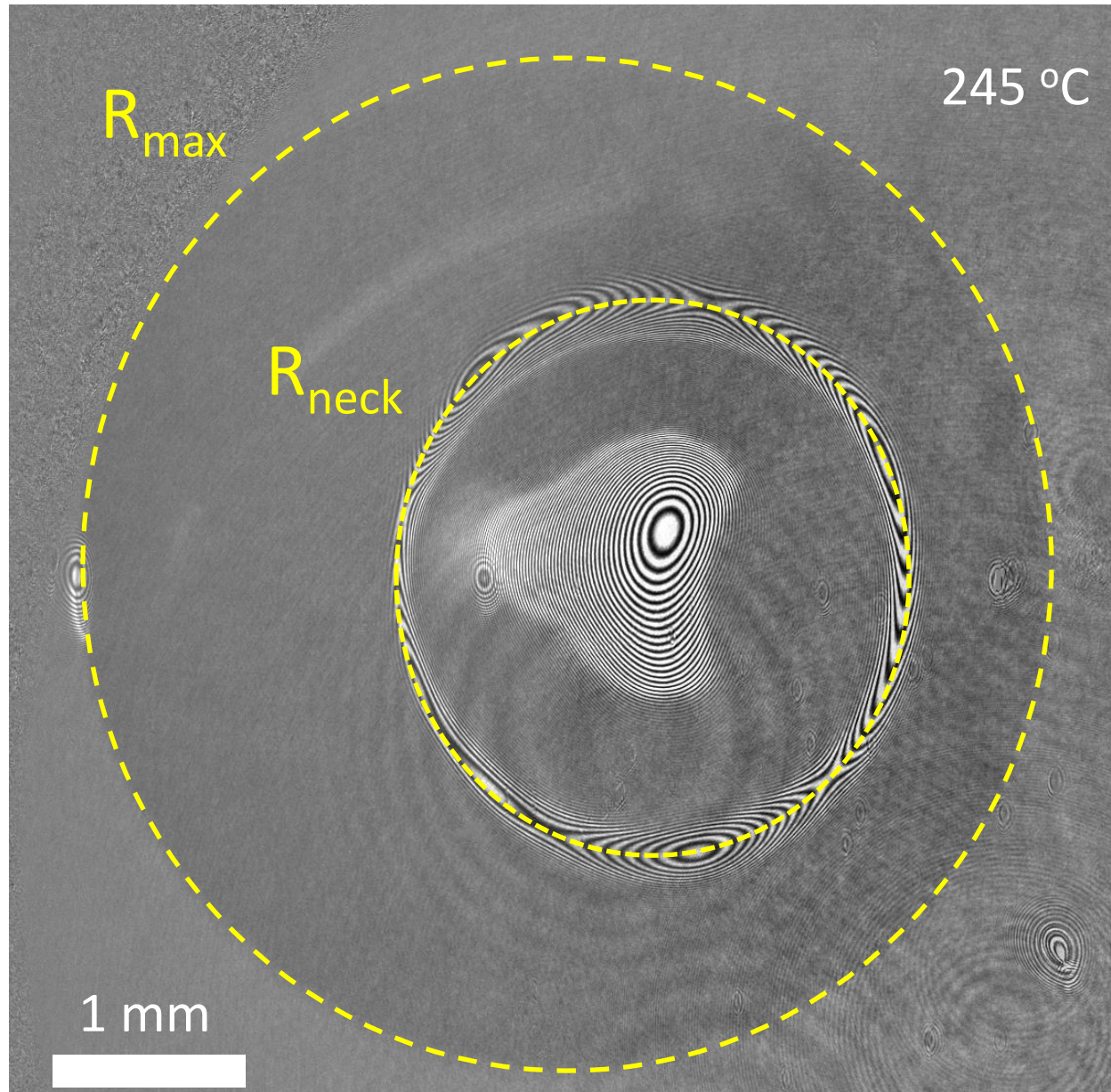
Interference patterns of small and large drop for $T_s = 245^\circ\text{C}$



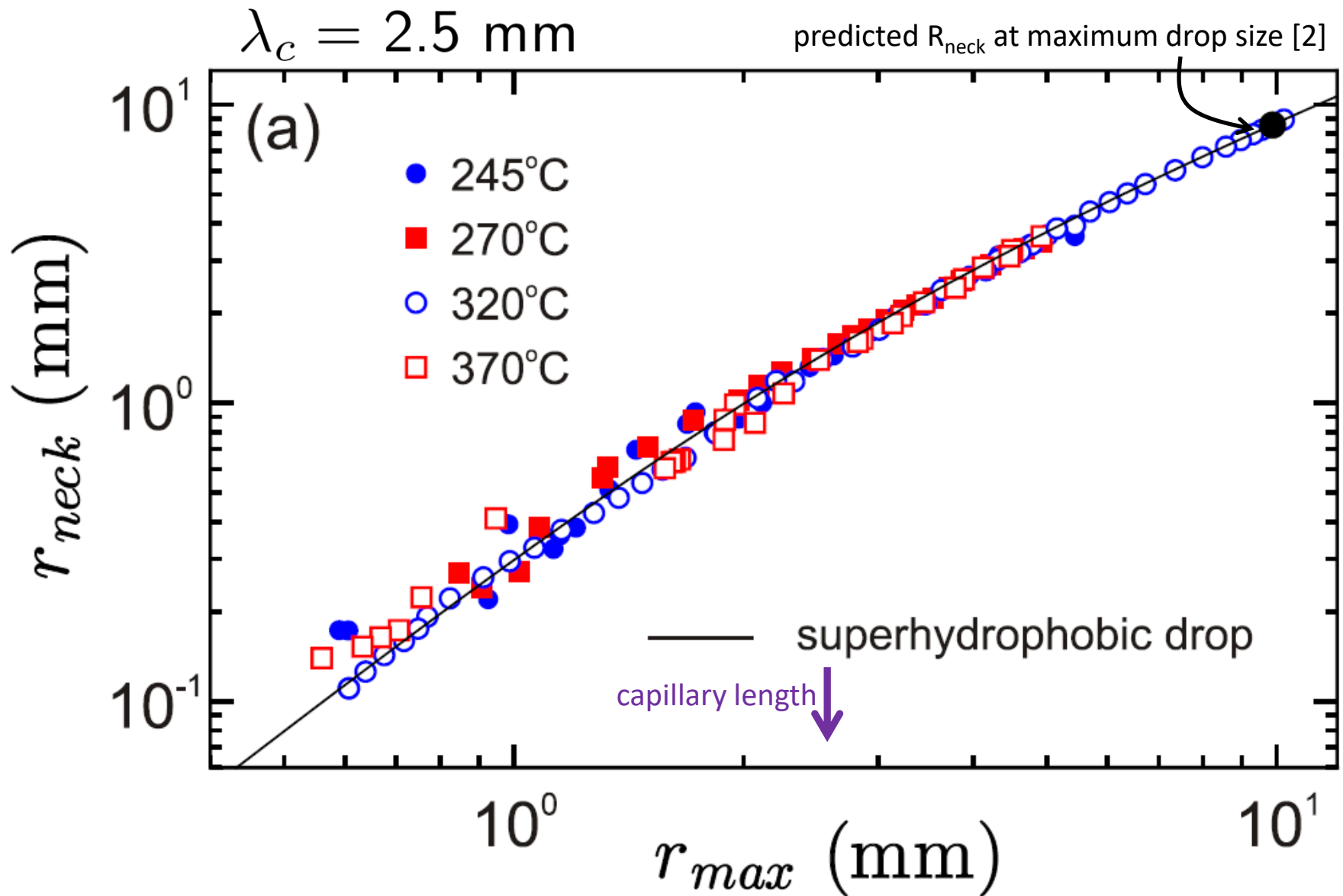
Number of extrema in the inner gas pocket region



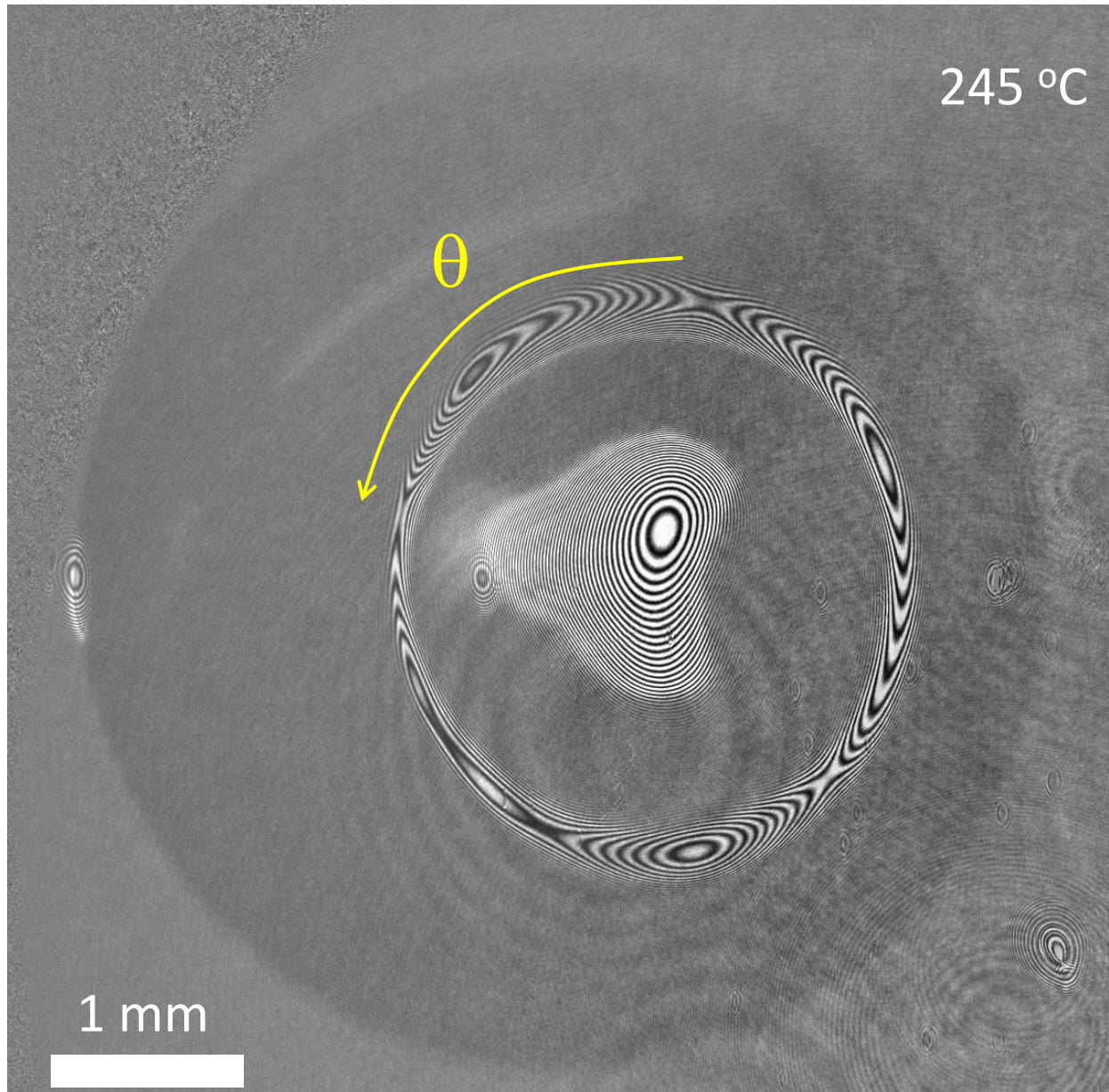
Drop and Neck Radii



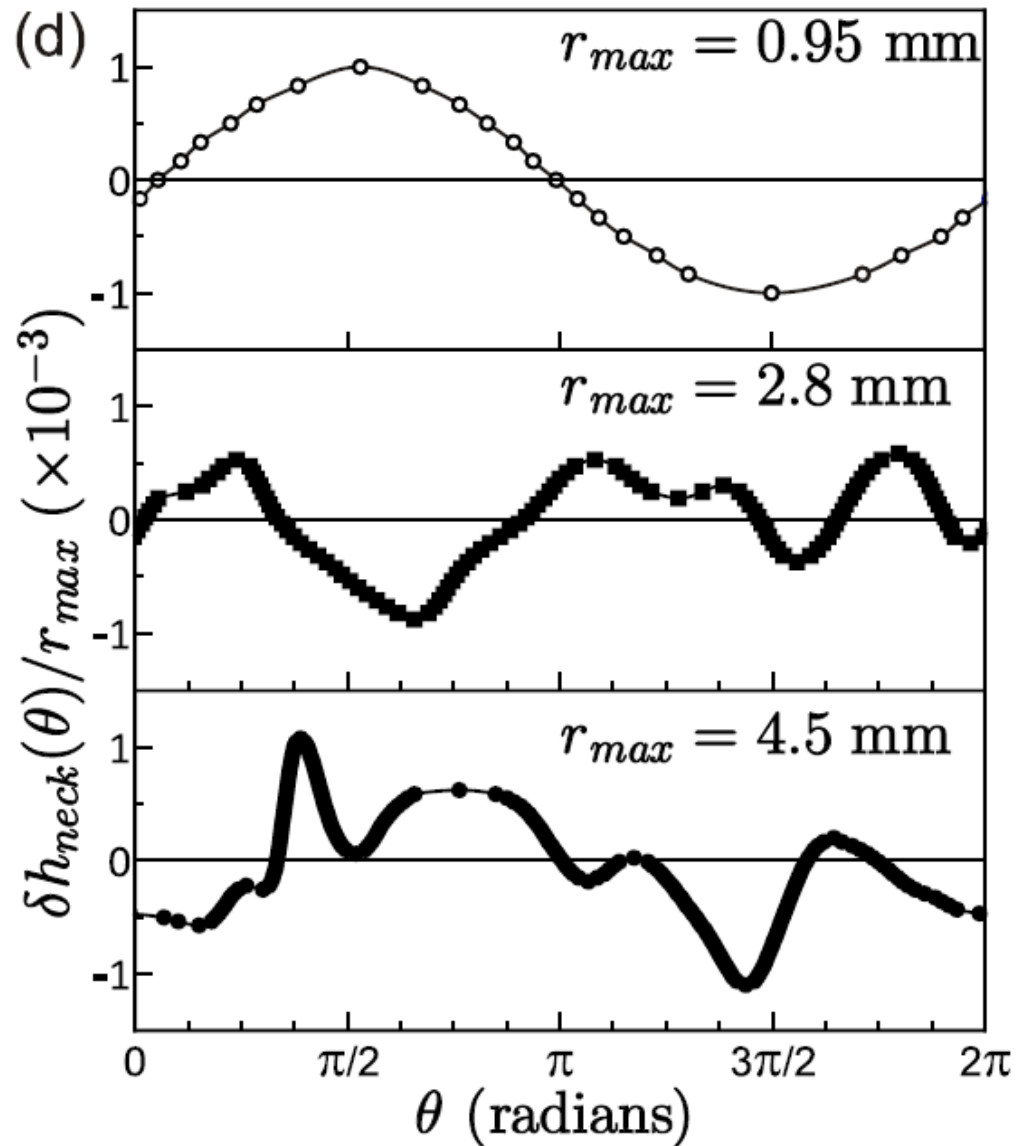
Neck Radius vs. Drop Radius

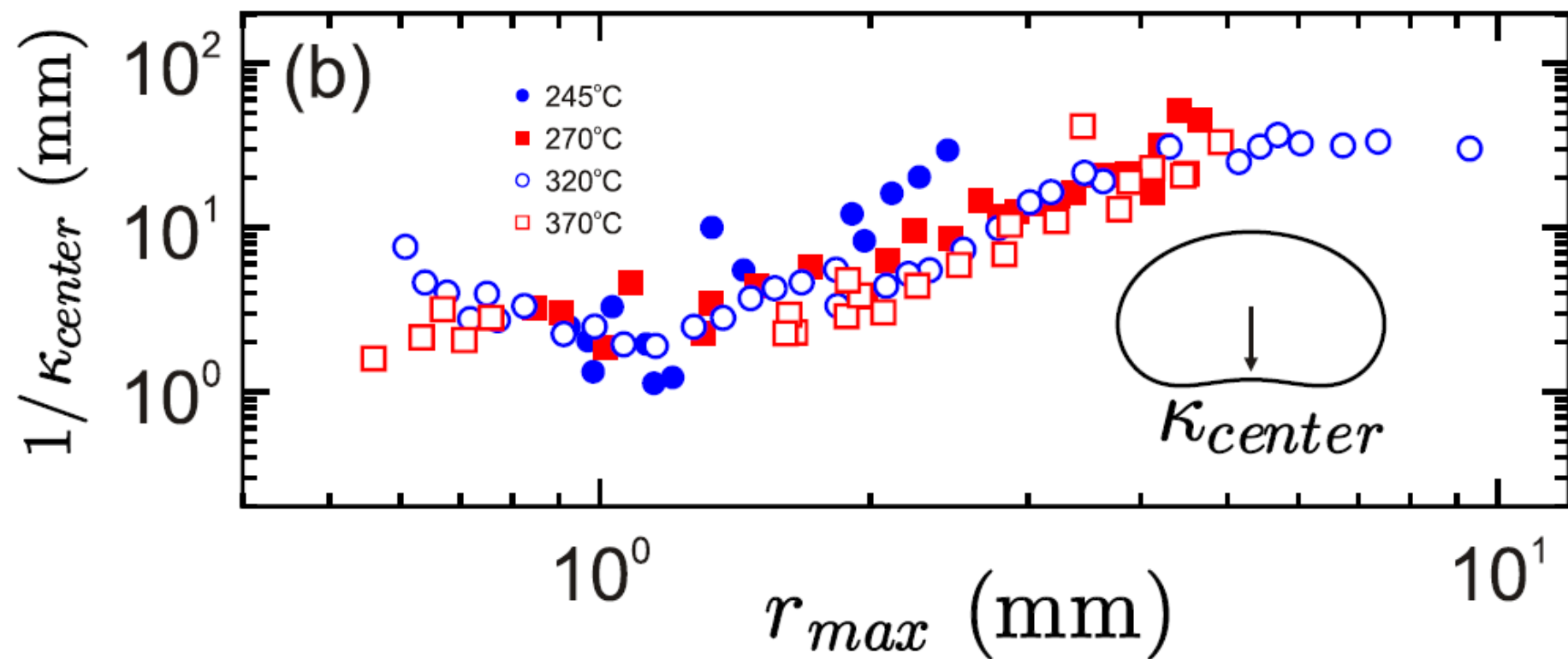


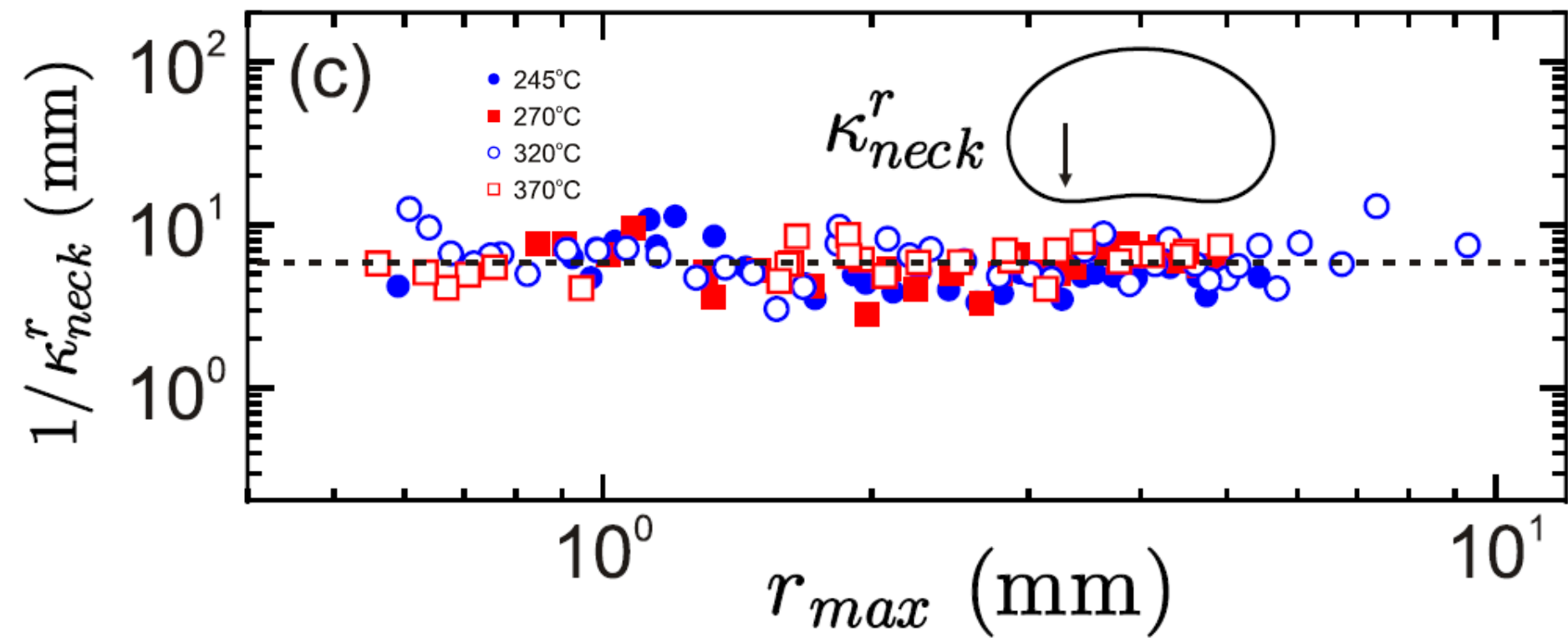
Neck Fluctuations

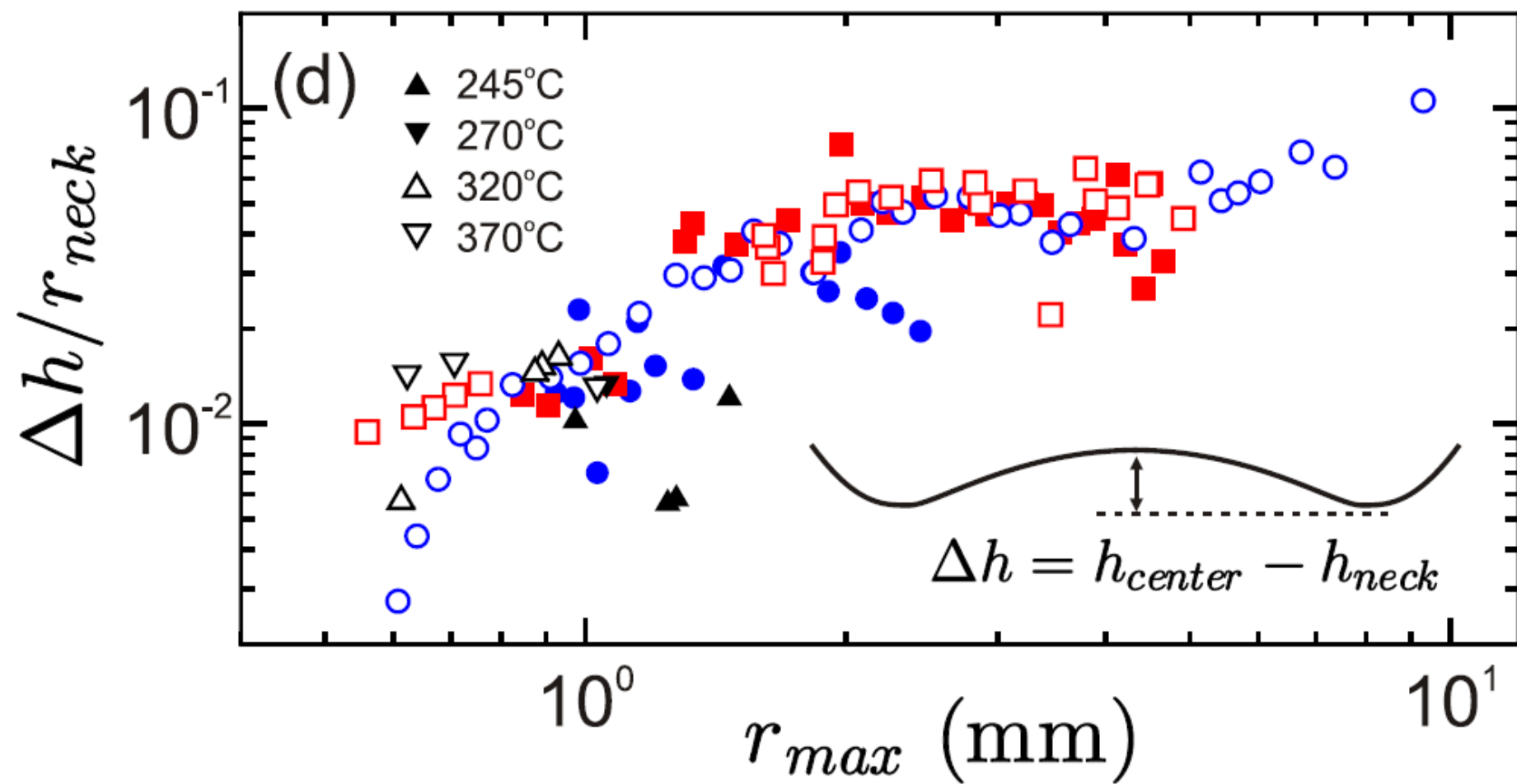


Variation of neck height with $T_s = 370^\circ\text{C}$









Conclusions

- Ultrafast Interference imaging from below
 - vapor layer geometry previously inaccessible
- R_{neck} temperature independent
 - different scaling for small and large drops
- Fluctuation amplitude $\approx 5\%$ of H_{neck}

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Nagel Group

