Intelligent Vision Enables Data-driven Analysis about Boiling Phenomena

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Bubble Morphology

- Bubble Topology
- Bubble Size

Bubble Interactions

- Lateral Interaction
- Upward Interaction
- Downward Interaction

Spatiotemporal Features

- Growth Rate
- Departure Frequency
- Nucleation Site
- Trajectory
- Departure Velocity

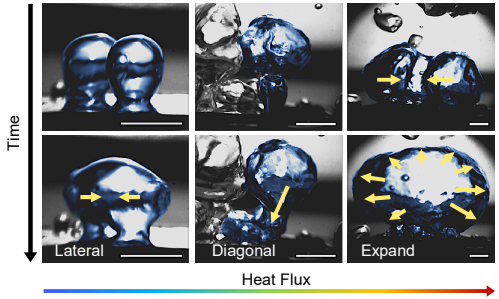
Surface Effects

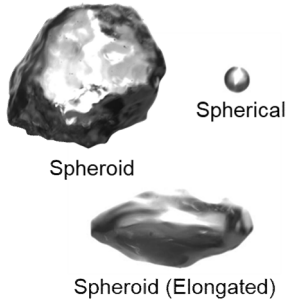
- Structural Effect
- Wettability

Fast and Furious Bubble Dynamics

A boiling surface produces hundreds of dynamically interacting bubbles per second.

Until now, it has been challenging to measure all bubble features due to the highly vigorous and complex nature of bubble dynamics despite the significance of collecting big data bubble statistics.





Key findings

- Automated computer vision enables the extraction of physical descriptors on live-bubble images
- Bubble statistics allow the experimental decomposition of latent heat-induced heat transfer to the overall boiling heat flux

Automated Big Data-Mining of Key Bubble Statistics