TUAT Fluid Dynamics Seminar

Harnessing acoustically driven two-phase fluids

Lecturer:

Assistant Prof. of ETH Zurich

Outi Supponen

Date: Friday, 31th March, 2023

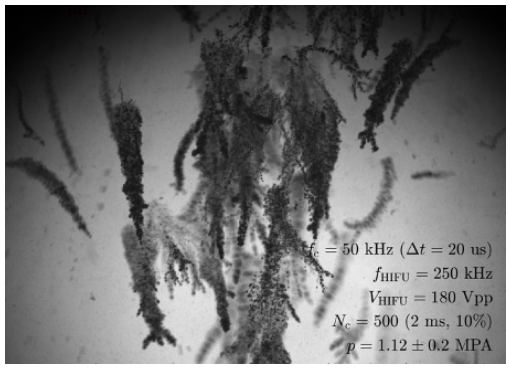
Time: 14:00 - 15:00 / Place: Building 6 - Room201

Biography

Outi Supponen is Assistant Professor of Multiphase Fluid Dynamics at the Institute of Fluid Dynamics of ETH Zurich since February 2020. She received her MEng degree in aeronautical engineering from Imperial College London, UK, in 2013, and her DSc degree in mechanics from the Ecole Polytechnique Fédérale de Lausanne, Switzerland, in 2017. From 2018 to 2019, she was a Postdoctoral Fellow with the University of Colorado at Boulder, USA. Her group's research focuses on experimental investigations of high- speed multiphase fluid phenomena, with applications in biomedical engineering, material science, and in hydraulic machinery, among others. Besides doing high-speed experiments on bubbles and droplets, Outi likes to go to remote mountains with skis.

Abstract

Bubbles oscillate volumetrically under the effect of pressure fluctuations, such as those produced by underwater sound waves. When driven into a violent collapse, they can yield strong sound emissions, high-speed jets, and extreme heating – a behaviour known as cavitation. Here, we will present ongoing research efforts to reach a fundamental understanding of the intriguing dynamics of acoustically driven bubbles across a wide range of scales from a single bubble level to that of bubble clouds. For this, we generally combine theory with ultra-high-speed experiments ranging from videomicroscopy and synchrotron X-ray imaging to laser-based measurement techniques. More specifically, we will report on our progress in temporally resolving acoustically driven microbubble oscillations and microdroplet vaporisation, elucidating the role of cavitation in ultrasound-mediated tissue adhesion and kidney stone destruction, and describing shock-driven bubble collapses. The broad aim of this research lies in the quest for harnessing the power of acoustically driven two-phase fluid media for a variety of engineering applications, including medical ultrasound diagnostics, drug delivery, lithotripsy, sonochemistry, surface cleaning and micro-fluidics.



Organized by: Prof.Y.Tagawa (tagawayo@cc.tuat.ac.jp)