ETH zürich

Institute of Fluid Dynamics
Institute of Energy and Process Engineering

Colloquium Thermo- and Fluid Dynamics

Mass transfer at the ocean-atmosphere interface: the role of wave breaking, droplets and bubbles

Prof. Luc Deike
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Physical processes at the ocean-atmosphere interface have a large effect on climate and weather by controlling the transfer of momentum and mass. In particular, ocean spray aerosols are tiny water droplets and solid particles (from tens of nanometers to hundreds of microns) emitted at the ocean surface by wave breaking and bubble bursting during storms and residing into the atmosphere. Ocean spray aerosols provide a pathway to transfer salt, biological material or microplastics from the ocean into the atmosphere, affecting the climate system through the radiative balance and the formation of clouds. I will discuss recent efforts in my group towards improving our understanding and modelling of sea spray production through a multi-scale framework. We combine laboratory experiments and numerical simulations on turbulent multiphase flows, including wave breaking, bubble break-up in turbulence and spray production by bubble bursting together with a statistical description of breaking waves. This framework aims to account for the very large range of scales involved in the process, from wave statistics scales of the order of km, O(1m-1km), to wave breaking dynamics, O(1-10m), air bubble entrainment, bubble dynamics in turbulence and finally bubble bursting at the free surface, O(microns to mm).

Luc Deike is an Associate Professor in the Department of Mechanical and Aerospace Engineering and the High Meadows Environmental Institute since 2017. Before, he was a Postdoc at the Scripps Institution of Oceanography at the University of California-San Diego. Deike received his Ph.D. from the University Paris Diderot in 2013. Among other awards he received the NSF CAREER award in 2019, the Frenkiel award from the American Physical Society - Division of Fluid Dynamics (APS-DFD) in 2023, and the McGraw Graduate Mentoring Award from the Princeton University Graduate School and the McGraw Center for Teaching and Learning in 2023. His research focuses on fundamental fluid dynamics with an emphasis on multi-scale systems, motivated by their importance in environmental and industrial applications, including ocean-atmosphere interaction, aerosol science, and multi-phase turbulent flows.

Date: Wednesday, 11 September 2024
Time: 16:15 - 17:15 h
Place: ETH Zurich, ML H 44
Host: Prof. Filippo Coletti

Further information: https://ifd.ethz.ch/events/ktf.html

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