Fachbereich 4
Produktionstechnik
Maschinenbau &
Verfahrenstechnik

CENTER OF
APPLIED SPACE TECHNOLOGY
AND MICROGRAVITY
ZARM

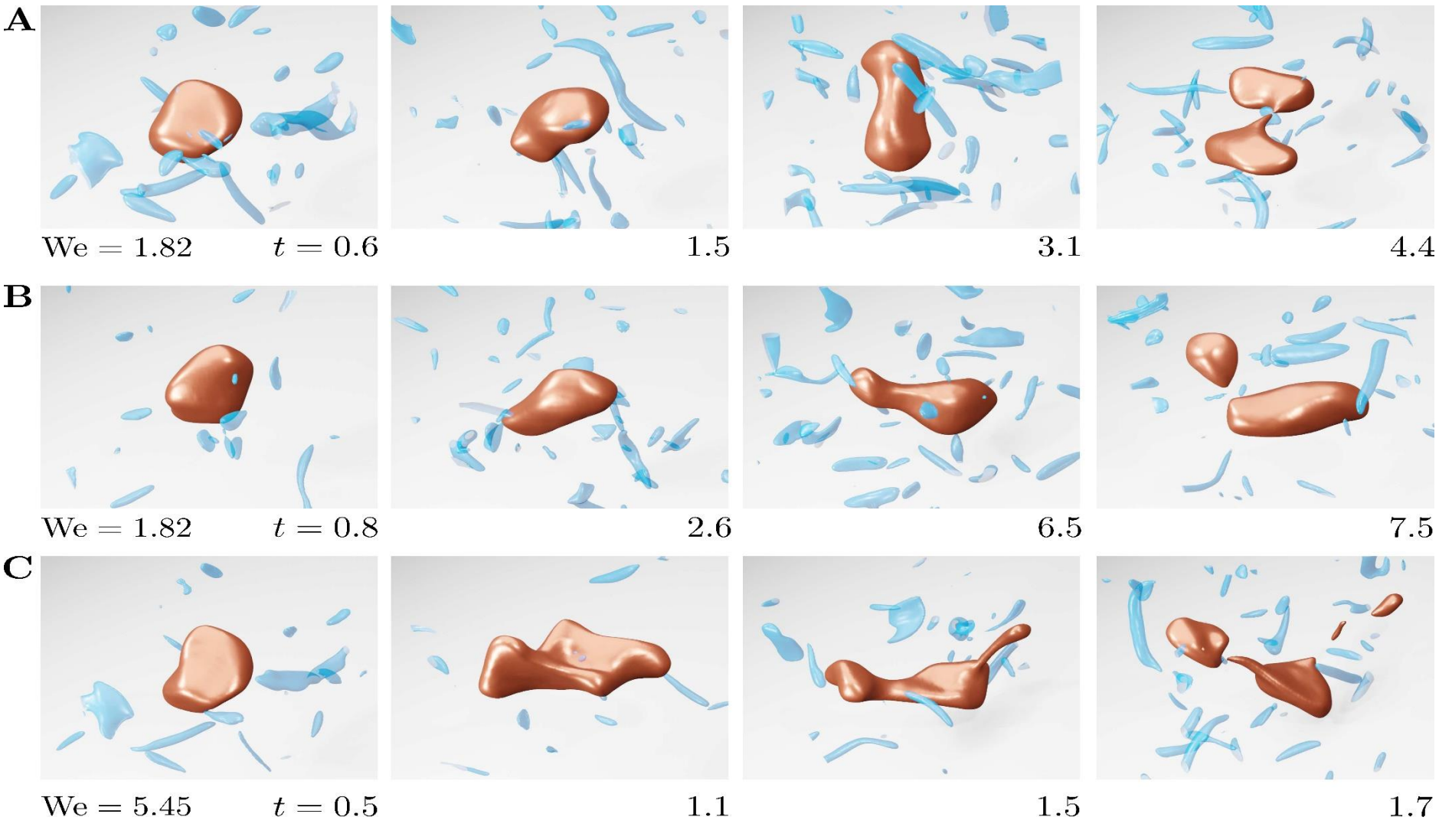
Fluids and Space Engineering Seminar

Date: Thursday, May 25, 2023 at 14:15 h
Location: ZARM, Room 1730

Drop breakup in turbulent flows

Prof. Marc Avila

University of Bremen, Center of Applied Space Technology and Microgravity (ZARM)



The breakup of drops and bubbles in turbulent fluids is a key mechanism in many environmental and engineering processes, including the emulsification of immiscible liquids, sprays, rainfall and the liquid-gas exchange at the ocean-atmosphere interface. Even in the well-studied dilute case, quantitative descriptions of drop fragmentation remain elusive, and many empirical models have been proposed to date. In this talk, I will show that in homogeneous isotropic turbulence, drop breakup is a memoryless process. The corresponding time constant increases exponentially as the Weber number decreases. As a consequence, dilute emulsions evolve through a continuous fragmentation process with exponentially increasing time scales. I'll conclude the talk by demonstrating that breakup is caused by outer eddies capable of generating strain at the drop surface by virtue of the non-local coupling between vorticity and strain rate. Modelling approaches exploiting this finding will be discussed in the context of extreme (rare) events in turbulence, drawing an analogy to turbulence transition in pipe flow.
The presented work has been done together with Dr. Alberto Vela Martín.