SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 01.02.2021
(י"ט בשבט תשפ"א),בשעה 14:30 באמצעות הזום: https://technion.zoom.us/j/99742755615

מרצה:

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על הנושא:

Experimental Investigation on the Breakup and Transport of Oil Slicks by Breaking Waves

The seminar will be given in English

להלן תקציר ההרצאה:

Prediction of the disperse phase breakup and transport under turbulence with wide range of scales is a critical subject in multiphase flow studies. Although significant efforts have been dedicated to quantifying these processes, still no unified theory exists enabling prediction of transient droplet generation, mixing and dispersion in turbulent environment characterized by extended time- and length-scales. This talk concerns one such example during the oceanic oil spill events, where spilled oil often forms coherent oil slicks at the ocean surface due to buoyancy and is subsequently broken up and entrained by breaking waves.

The study of oil spill dispersion process with the application of dispersant was aimed to acquire baseline data on the initial size distribution and subsequent transport of oil droplets generated by breaking waves, which are deemed crucial for modeling the physical, chemical and biological processes after an oil spill. In this work, a controlled oil slick of varying viscosity, density, interfacial tension was entrained by waves of varying energy. The temporal evolution of turbulence has been quantified using particle image velocimetry (PIV). In parallel, multi-resolution digital inline holography (DIH) was used for measuring the droplet size distributions, and at varying temporal scale, from the initial plunging phase (seconds) to long term (hours), simultaneously with high-speed visualizations of the droplet breakup and large-scale features of the entrainment process. The application of dispersant aimed at reducing the interfacial tension, was found to cause the droplets to fall in the micron- and submicron-scales and to drastically change their size distribution. The generated droplet sizes were much smaller than the turbulence scales, in part due to micro-threading at the oil-water interface. The droplet fragmentation persisted long after the wave breaking. Furthermore, dispersants increased the airborne nano-droplet concentration by orders of magnitude, thus raising health concerns. The data generated in this project have been provided to National Oceanic and Atmospheric Administration in United States and SINTEF - Foundation for Industrial and Technical Research in Norway, for the development of oil spills models.

The results unveiled various mechanisms that turbulence exerts on the disperse phase breakup and transport. Future efforts are needed to simultaneously quantify both phases in details, in order to validate turbulent flow closure models for Eulerian-Eulerian, or Eulerian-Lagrangian simulations and develop methods for controlling the disperse phase features, such as the size distributions and the dispersion characteristics.

מארח: פרופ' מיכאל שפירא

בברכה,

פרופ"ח אתי סאס
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