



TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Dipartimento di Fisica



European Research Council
Established by the European Commission

Seminar

Wednesday, 8 February 2023 - h. 14:30

Fisica della Materia room (Department of Physics)

Dr. Marco Crialesi Esposito

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“Emulsions in HIT, an insight on multiphase turbulence”

Abstract

The dynamics of multiphase flows in turbulence is key in several industrial applications and in many environmental flows. A crucial aspect of these problems is the presence of the interface, which offers an alternative path for energy transport across scales, altering significantly the nature of turbulent energy cascade. The interaction of velocity fluctuations and surface tension forces at each scale also contributes to the formation of droplets, originating a droplet-size-distribution, which underlying physics is yet to be explained. An ideal framework for the study of these feature of multiphase turbulence is provided by emulsions, composed by two immiscible phases with matching densities, where Weber number, viscosity ratio and volume fraction can be easily varied to investigate a vast region of the phase-space. In this talk I will discuss a set of numerical experiments performed in homogeneous and isotropic turbulence by focusing on the scale-by-scale energy budget in Fourier space. Some insight will be provided on small-scale dynamic, showing how the dissipative range is extended by the presence of the interface. Ultimately, we propose a physical picture explaining how the Kolmogorov-Hinze (KH) scale (i.e. the size of the largest droplet undergoing breakup in turbulence) can be interpreted as the scale where energy transport through surface tension is null. This definition sets the ground for a reinterpretation of the KH scale through the K62 theory, showing that key in the fragmentation process is the local flux of energy which dominates the process at large scales, vindicating its locality. Finally, I will present some implications on intermittency, a key feature in multiphase flows.

ERC-2019-ADG Grant N. 882340 “Smart-TURB”

(P.I. Prof. Luca Biferale)

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