SEMINAR SERIES

湍流与复杂系统全国重点实验室

Turbulent modulation in homogeneous flows: two-fluid systems and rigid particles

报告人：Luca Brandt

时　间：3 月 11 日 周三 下午 15:00

地　点：工学院 1 号楼 210 会议室

报告内容摘要：

Emulsions are multiphase flows of two immiscible (totally or partially) liquid phases with similar densities. Similarly, the transport of rigid particles is an everyday observation. Both flows are most commonly turbulent in nature and ubiquitous in natural and engineering applications. The richness and complexity displayed by these flows is due to the different particle and fluid/flow properties, and the enormous disparity of scales, which is reflected in the large number of governing parameters. These have made such flows a formidable challenge for scientists and engineers. Here, we will resort to interface-resolved simulations to tackle the problem.

Firstly, we consider a mixture of two iso-density fluids and vary the volume fraction of the dispersed phase, the viscosity ratio and the surface tension coefficient to study the turbulence modulation. We examine integral quantities and the spectral scale-by-scale analysis and demonstrate that energy is transported consistently from large to small scales by the interfacial stresses, and no inverse cascade is observed. Recent results on bubbly flows will be presented to highlight similarities.

Secondly, we investigate the behavior of rigid nonspherical particles. We will document increased clustering when studying settling non-spherical particles in a quiescent fluid, and the characteristics of the turbulent flow induced by the settling objects, the so-called pseudo-turbulence. Finally, we will document the modulation of homogeneous turbulence by settling particles.

报告人简介：

Luca Brandt joined the Department of Environment, Land and Infrstructure Engineering, Politecnico di Torino, Italy, as professor in Hydraulics in February 2024.

Previsouly, he was professor in Fluid Mechanics at the Royal Institute of Technology (KTH), Stockholm, Sweden (2012-2024) and at the Department of Energy and Process Engineering, NTNU, Trondheim, Norway (2019-2024). He received a Master degree in Mechanical Engineering from University of Rome, La Sapienza in 1997, and PhD in Fluid Mechanics at KTH in 2003. Before joining KTH as assistant professor he spent several months at Ecole Polytechnique, Palaiseau, France and at the University of Bologna, Italy. Luca's research interests are in the general area of multiphase flows, complex fluids, particle laden flows, heat and mass transfer, turbulence and low-Reynolds-number flows, hydrodynamic instabilities and flow control, with focus on the development of high-fidelity numerical simulations and theoretical models. He has more than 200 peer-reviewed journal papers including 1 Annual Review Fluid Mechanics in 2022. He was the recipient of an ERC consolidator grant to study particle suspensions in 2013 and of the "outstanding young researcher" award from the Swedish Research Council in 2014. He had been awarded the International Panetti Ferrari Prize and Golden Medal in the field of applied mechanics, Accademia dei Lincei, Turin, Italy, in 2022, the position as outstanding researcher in Mechanics by the Swedish Research Council in 2008 and the G. Gustafsson prize in 2005. Luca served the community organizing several workshops and summer schools and as associated editor of the European Journal of Mechanics/B and MECCANICA.

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