

湍流与复杂系统全国重点实验室

Thermally driven turbulence with phase change

报告人: Roberto Verzicco

单 位: Gran Sasso Science Institute

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地 点: 力工学院 1 号楼 210 会议室



报告内容摘要:

There are countless phenomena in Nature and technology where turbulent flows are driven by temperature differences which are dynamically coupled to melting/freezing of a solid/liquid phase. The interaction between these phenomena is a relevant, interesting and complex problem, in which fluid dynamics and thermodynamics are intimately coupled. Ice/ocean interfaces, casting of metals into molds and latent thermal energy storage devices are just a few relevant examples governed by the above-described dynamics. These processes belong to the class of moving free boundary problems (also referred to as Stefan problems), which are very challenging since the boundaries of the domains are usually unknown and have to be determined as part of the solution. In particular, the presence of fluid motion modifies the transport of heat which is crucial to the melting and freezing dynamics.

In this seminar we will present results from a selection of model problems which have been studied using direct numerical simulations using the phase field method. We will show the dynamics of Rayleigh-Bénard convection with an upper melting boundary, Layering and ice-melting phenomena in salty water up to Lagrangian melting problems in which not only the interface shape but also the position and attitude of the solid phase has to be determined during the integration.

报告人简介:

Roberto Verzicco is professor of Fluid Dynamics at Gran Sasso Science Institute in L'Aquila, Italy. Since 2010 he is also part-time Professor at the University of Twente. He

received his M.S. in Aeronautic Engineering (1991) and Ph.D. in Aerospace Engineering (1994) both from University La Sapienza in Rome. His research, in the fields of experimental and numerical fluid dynamics, includes direct numerical simulation of turbulent flows, convective turbulence and bio-fluid mechanics. Since 1993 he has published more than 300 papers in international journals with 3 solicited reviews. He has published a monographic book on Immersed Boundary Methods with Cambridge University Press. He has organized several international conferences, workshops and colloquia and in 2012 he chaired the 9th European Fluid Mechanics Conference in Rome. Since 2012 he is Associate Editor of the Journal of Fluid Mechanics and since 2025 he is the President of Euromech. In November 2005 he received the Frenkiel Award 2005 from the American Physical Society for his studies on natural convection and in 2022 the Corrsin Award for the immersed boundary method. In 2012 he was elected EUROMECH Fellow and in 2013 APS Fellow.

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