

ICTS MONTHLY COLLOQUIUM

OPEN QUESTIONS IN TURBULENT STRATIFIED MIXING: Do we even know what we do not know?

Understanding how turbulence leads to the enhanced irreversible transport of heat and other scalars (such as salt and pollutants) in density-stratified fluids is a fundamental and central problem in geophysical and environmental fluid dynamics. There is a wide range of highly important applications, not least the description and parameterization of diapycnal transport in the world's oceans, a key area of uncertainty in climate modelling. Recently, due not least to the proliferation of data obtained through direct observation, numerical simulation and laboratory experimentation, there has been an explosion in research activity directed at improving community understanding, modelling and parameterization of the subtle interplay between energy conversion pathways, turbulence, and irreversible mixing in density-stratified fluids. However, as I will discuss in this talk, there are still leading order open questions and areas of profound uncertainty concerning turbulent stratified mixing. Therefore, I will present a personal perspective on some priorities for further research into this hugely complex, important and fascinating fluid dynamical challenge.

C. P. CAULFIELD

Colm-cille P. Caulfield is Professor of Environmental and Industrial Fluid Dynamics at the University of Cambridge. He is Head of the Department of Applied Mathematics and Theoretical Physics, a member of the BP Institute for Multiphase Flow, and a Professorial Fellow of Churchill College. He has held faculty positions in Mathematics at the University of Bristol and in Environmental Engineering at the University of California, San Diego.

His research focuses on stability, transition, turbulence and mixing in environmental and industrial flows, particularly where density differences play a dynamically significant role. He is a fellow of the American Physical Society (Division of Fluid Dynamics), a member of the Society (Division of Fluid Dynamics), a member of the Executive Committee of the Summer Study Program in Geophysical Fluid Dynamics at the Woods Hole Oceanographic Institution, and an Associate Editor for the Journal of Fluid Mechanics (Rapids).

3.30 pm,
13 July 2020



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