For favour of Posting

THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SPECIAL COLLOQUIUM

Space-time correlations and data-driven modeling for turbulent flows

By

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Abstract

Space-time correlations, or their equivalent wave number-frequency spectra, are the minimal description of the spatiotemporal dynamics of turbulent flows, with their critical applications in turbulence-generated noise and flow-structure interactions. Considerable efforts have long been devoted to understanding space-time correlations and developing the models for numerical prediction. Moreover, recent advances in machine learning have opened transformative new opportunities for addressing these problems. In this talk, I will briefly introduce the main results of space-time correlation, and then propose a solvable model for scalar turbulence, which yields its exact expression and confirms the well-known decorrelation process in turbulent flows. Finally, I will present the data-driven turbulent models which are time-accurate for numerical simulation and designed to overcome "catastrophic forgetting" in machine learning for turbulent flows. The application of large eddy simulation in the radiated noise from turbulent flows around an underwater vehicle is also presented.

Bio: Guowei He is an Academician of the Chinese Academy of Sciences and Professor at the State Key Laboratory of Nonlinear Mechanics, Institute of Mechanics, CAS, where he has served since 2002 and currently acts as Academic Director. Prof. He's research spans turbulence statistical theory and computational modeling, large-eddy simulation (LES), and machine learning for multiscale mechanics. His representative works include contributions to space–time correlations and dynamic coupling in turbulence, immersed-boundary and LES methodologies, and data-assimilative/model-learning approaches for turbulence. He currently serves as Associate Editor of Physical Review Fluids and as President of the Chinese Society of Theoretical and Applied Mechanics (since 2025).

Date : 04 February 2026 (Wednesday)
Time : 4:00p.m.-5:00p.m.
Venue : Room 2303 (near lift 17/18)

All Are Welcome!