SEMINAR SERIES

北京大学工学院 力学与工程科学系

湍流与复杂系统国家重点实验室

GPU-based exascale computing for turbulence

朱晓珏 研究员

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主持人：杨延涛 副教授

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地　点：工学院一号楼 209 会议室

报告内容摘要：

Turbulence research is essential for understanding fluid behavior in various physical systems, such as star formation, atmospheric dynamics, and vehicle design. However, accurately simulating ultimate turbulence, where turbulence is independent of diffusivities, poses a significant challenge due to the immense computational power required, beyond the capabilities of current supercomputers. For example, Germany's largest CPU supercomputer, SuperMUC, would require 500 billion grid points and around 400 million CPU hours to simulate the transition to ultimate turbulence for convection. To overcome these limitations, new approaches are needed. In the coming years, the advancements in exascale computing hold promising solutions. At this moment, construction is underway for JUPITER, Europe's first exascale supercomputer, located at the Forschungszentrum Jülich campus in Germany. In this talk, I will introduce our recent progress on developing next-generation turbulence simulation tool, i.e. a flexible portable solver for multiple exascale computers that will work on both NVIDIA and AMD exascale computers. By leveraging the GPU-based exascale computer, we can push the boundaries of turbulence research, gain valuable insights, refine turbulence models, and drive advancements in fields where turbulence plays a crucial role.

报告人简介：

Dr. Xiaojue Zhu (朱晓珏) is currently an independent Max Planck Research Group Leader at the Max Planck Institute for Solar System Research in Goettingen, Germany. His group's major research fields are turbulence, fluid-strurcture interaction, free surface flow, and the associate numerical techniques. He obtained his PhD from the Physics of Fluids Group at the university of Twente in the Netherlands in 2018. After that, he was a postdoc researcher at Harvard University for 2 years. He has published 35 papers in refereed scientific journals, including Nature Physics, Reports on Progress in Physics (invited review), PNAS, Physical Review Letters, Astrophysical Journal Letters, Journal of Fluid Mechanics.

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