UNIVERSITY OF MARYLAND

THE BURGERS PROGRAM FOR FLUID DYNAMICS
THE FLUID DYNAMICS REVIEWS SEMINAR SERIES

COMPUTATIONAL AND THEORETICAL STUDY OF WIND-WAVE INTERACTIONS

Friday, December 3, 2021 | 11am

DeWalt Seminar Room
2164 Glenn L. Martin Hall

Speaker

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ABSTRACT

The interactions between wind turbulence and water surface waves is a classic fluid mechanics problem with many important geophysical, environmental, and engineering applications. To obtain improved understanding of the fundamental mechanisms of wave-turbulence interactions, we developed an advanced computational tool called Wave-Ocean-Wind (WOW) and used it to perform wave-phase-resolved simulations for nonlinear wave fields and direct numerical and large eddy simulations for turbulent airflows over waves to study different aspects of the problem. From computer simulations and theoretical analyses, we developed a viscous curvilinear model to explain the dynamics of wind over opposing waves and fast following waves. On the initial generation of waves, we obtained direct numerical evidence that supports Phillips' theory and further extended the analyses of Phillips' resonance mechanics. We also elucidated the role of nonlinear wave-wave interaction in developed wind-wave fields.

BIO

Professor Lian Shen earned his Bachelor's Degree in Mechanical Engineering from University of Science and Technology of China in 1993, and Doctor of Science Degree in Fluid Mechanics from Massachusetts Institute of Technology in 2001. He currently holds the position of Kenneth T. Whitby Professor in the Department of Mechanical Engineering at University of Minnesota. He also serves as the director of the St. Anthony Falls Laboratory. Professor Shen's research interests include computational fluid dynamics, water waves, turbulence, geophysical and environmental fluid flows, and renewable energy.

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