**COLLOQUIUM**

Department of Computer Science and Engineering

University of South Carolina

**Proper Orthogonal Decomposition Reduced-Order Modeling of Complex Fluid Flows**

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# Abstract

In many scientific and engineering applications of complex fluid flows, computational efficiency is of paramount importance. However, because of the requisite of repeated numerical simulations in applications such as control, optimization, data assimilation, and uncertainty quantification, using the original system becomes prohibitive. Therefore, model reduction techniques have been frequently used by engineers and researchers. Among them, proper orthogonal decomposition is one of the most commonly used methods to generate reduced-order models for turbulent flows dominated by coherent structures. To achieve a balance between the low computational cost required by a reduced-order model and the complexity of the target turbulent flows, appropriate closure modeling strategies need to be employed. In this talk, we present reduced-order modeling strategies synthesizing ideas originating from proper orthogonal decomposition and large eddy simulation, develop rigorous error estimates and design efficient algorithms for the new reduced-order models.

**Dr. Zhu Wang** is an assistant professor in the Department of Mathematics at University of South Carolina. He earned his PhD in Mathematics from Virginia Tech in 2012, and he was an industrial postdoc of the IMA at University of Minnesota, Twin Cities in 2012-2014. Dr. Wang’s research interests are scientific computing, numerical analysis, reduced-order modeling, climate modeling, large eddy simulation, and numerical solutions to PDEs.