Northeastern

Department of Civil and Environmental Engineering Distinguished Seminar Series

Advanced physical and numerical modeling of atmospheric boundary layer flow for wind engineering applications

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458 Richards Hall

Abstract

Wind load and wind-resistance performance of wind-sensitive structures such as high-rise buildings, long-span bridges and large-roof structures are the great concerns of structural engineers. The structures are immersed in an Atmospheric Boundary Layer (ABL), thus appropriate modeling of an Atmospheric Boundary Layer is necessary in order to estimate the dynamic interaction between the wind and structure. Modeling of an ABL usually involves the modeling of statistical features of the flow such as mean velocity, turbulence intensity, power spectrum and so on, but sometimes also requires the reproduction of the time series of wind speed when transient features of the wind are of concern. This seminar presentation presents the physical and CFD work carried out by the author to model the Atmospheric Boundary Layer flow and related applications. In addition, the recent activities and achievements on wind engineering in China are introduced.

Biographical Sketch

Dr. Shuyang CAO received his Bachelor Degree at Shanghai Jiaotong University, China in 1988, Master and Doctoral Degrees at Miyazaki University, Japan in 1998 and 2001. Dr. Shuyang CAO is currently a professor of Civil Engineering School of Tongji University, China, also a professor of the State Key Laboratory for Disaster Risk Reduction in Civil Engineering, China. Before he joined Tongji University, he was an associate professor and professor of Tokyo Polytechnic University, Japan during 2004-2009, assistant professor at Tokyo Institute of Technology, Japan during 2001-2004, loss control engineer of American International Group, Shanghai Branch during 1993-1994, and a researcher of China Shipbuilding Research Institute during 1988-1993. Dr. Shuyang Cao works on both structural and environmental wind engineering fields. He contributed significantly to the innovative research work initiated in Japan in 1990s that aimed to develop an actively-controlled multiple-fan wind tunnel to model the atmospheric boundary layer for wind engineering applications. He developed the first multiple-fan wind tunnel and first tornado-like vortex simulator in China. His research interest includes the fundamental and application of Computational Fluid Dynamics to wind engineering problems, bluff body aerodynamics and wind-resistant design of structures. Dr. Shuyang Cao published more than 50 papers in first grade conferences and journals. He was awarded three JSPS (Japan Society for the Promotion of Science) and thee NSFC (National Natural Science Foundation of China) research projects as a PI. He is the Secretary General and Board member of International Association for Wind Engineering.

Shuyang Cao, PhD

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Education

- PhD, Civil Engineering, Miyazaki University, Japan
- M.S., Civil Engineering, Miyazaki University, Japan
- B.Sc., Civil Engineering, Shanghai Jiaotong University, China

Research Interests

- Fundamental and application of Computational Fluid Dynamics, wind engineering
- Bluff body aerodynamics
- Wind-resistant design of structures
- Development of multiple-fan wind tunnel and tornado-like vortex simulator

Selected Service and Awards

- Secretary General and Board member, International Association for Wind Engineering
- PI in projects, JSPS (Japan Society for the Promotion of Science)
- PI in projects, NSFC (National Natural Science Foundation of China)
- Loss control engineer of American International Group, Shanghai Branch, 1993