



AEROSPACE ENGINEERING SCIENCES

Seminar

Professor Gianluca Iaccarino

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Institute for Computational Mathematics and Engineering
Stanford University

The Mathematics of Particle Solar Receivers

The US Department of Energy is funding a Multidisciplinary Simulation Center at Stanford to explore the boundaries of scientific computing in preparation for the launch of a new class of computers 100 more powerful than today's fastest supercomputer.

Stanford Center's research portfolio blends efforts in computer science, uncertainty quantization, and computational physics to tackle a challenging physical problem: the transfer of radiative energy to a turbulent mixture of air and solid particles. The context is provided by a relatively untested and poorly understood method of harvesting solar energy. Traditional solar-thermal systems use mirrors to concentrate solar radiation on a solid surface and transfer energy to a fluid, the first step toward generating electricity. In the proposed system, fine particles suspended within the fluid would absorb sunlight and directly transfer the heat evenly throughout the fluid volume.

The talk will describe the Center's plan to construct a computational environment to tackle this challenging multi-physics problem emphasizing the strategies employed to carry out high-fidelity simulation and how uncertainty quantification techniques can be used to improve the overall performance of the system. Some aspects of the computer science effort will also be described.

Bio: Gianluca Iaccarino is an associate professor in Mechanical Engineering and Institute for Computational Mathematical Engineering at Stanford University. He received his PhD in Italy from the Politecnico di Bari in 2005 working on numerical methods to simulate turbulent industrial flows. Afterward, he has been a postdoc at the Center for Turbulence Research working on physical models for flow simulations and heat transfer, with emphasis on high-performance computing. In 2008 Prof. Iaccarino started the Uncertainty Quantification Lab working on algorithms to assess the impact of tolerances and limited knowledge on the performance predictions of engineering systems, such as wind turbines, hypersonic propulsion systems, low-emission combustors. Since 2009, he has served as the director of the Thermal and Fluid Sciences Industrial Affiliate Program a forum for technology transfer and interactions between members of the Stanford community and engineering corporations - GE, United Technologies, Honda, Enginsoft, Safran, Ansys, Dassault, Total are among the members. In 2010 Prof. Iaccarino received the PECASE (Presidential Early Career Award for Scientists and Engineers) award from the US Department of Energy. In 2011 he received an Humboldt fellowship from the University of Munich.

Thursday, February 19, 2015, 2:00 – 3:00 PM
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