COMBUSTION WEBINAR

Towards Direct Numerical Simulation of Turbulent Combustion at the Exascale

Speaker: Dr. Jacqueline Chen, Sandia National Lab

Time: Feb. 13th 2021

10 am EST; 4 pm Paris; 11 pm Beijing.

Meeting link:
https://princeton.zoom.us/j/95955158623?pwd=aHdMQ3JVL1ZMUVZIbzRzWWdrU1FKZz09
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Biography

Jacqueline H. Chen is a Senior Scientist at the Combustion Research Facility at Sandia National Laboratories. She has contributed broadly to research in turbulent combustion elucidating turbulence-chemistry interactions in combustion through direct numerical simulations. To achieve scalable performance of DNS on heterogeneous computer architectures she leads an interdisciplinary team of computer scientists, applied mathematicians and computational scientists to develop an exascale direct numerical simulation capability for turbulent combustion with complex chemistry and multi-physics. She is a member of the National Academy of Engineering and a Fellow of the Combustion Institute and the Americal Physical Society. She is an Associate Fellow of the AIAA. She received the Combustion Institute's Bernard Lewis Gold Medal Award in 2018, the Society of Women Engineers Achievement Award in 2018, the Department of Energy Office of Science Distinguished Scientists Fellow Award in 2020, and the R&D100 Award for the Legion Programming System in 2020.

Abstract: Direct numerical simulation (DNS) methodology and computing power have progressed to the point where it is feasible to perform DNS in mildly complex geometries representative of flow configurations encountered in practical combustors. These complex flows encompass effects of mean shear, flow recirculation, and wall boundary layers together with turbulent fluctuations which affect entrainment, mixing and combustion. Recent DNS studies with complex flows relevant to high efficiency low emissions gas turbine and internal combustion engines will be presented to shed light on turbulence-chemistry interactions. Through application co-design with computer scientists a data centric asynchronous programming system has been used to refactor the DNS code, S3D, resulting in improved time-to-solution and overall performance on heterogeneous architectures. The programming system also provides more efficient and effective composition of *in situ* analytics and machine learning techniques.

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