

distinguished speakers series

The Department of Mechanical and Materials Engineering presents:

Dr. Jean-Pierre Hickey

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Pseudo-phase change in transcritical rocket combustion

Combustion in liquid rocket engines occurs at very high–pressures and relies on the high-energy density of cryogenic propellants to achieve the required mass flow-rate through the injector array. The combustion chamber pressure is typically above the critical pressure of both the fuel and oxidizer while the cryogenic propellants—and more specifically the oxidizer—are injected in a liquid-like, supercritical state. For combustion to occur, the liquid-like oxidizer must undergo a pseudo-phase change to a gas-like supercritical state by crossing over a pseudo-boiling line. The finite peak in the heat capacity at the pseudo-boiling point acts as a thermal barrier between the flame and the cryogenic propellant, which modifies the temperature profile, heat transfer to the dense core and, concomitantly, the flame structure, jet spreading and stability characteristics. The presentation focuses on the characterization of the pseudo-boiling point in non-premixed, high-pressure diffusion flames and proposes a stricter resolution requirement for transcritical combustion simulations to fully account for the real-fluid effects.



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FRIDAY, MARCH 11th - 11:00 ^{a.m.} McLAUGHLIN HALL ROOM 312