SDSU College of Engineering Mechanical Engineering

Mechanical Engineering Seminar Series

September 30th, 2025, 11:00AM

Dean's Conference Room, E-203E

Title: Wildfire Dynamics at the Wildland Urban Interface: Propagation and Ignition

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Abstract: Recent wildfires at the Wildland Urban Interface (WUI), where developed areas and natural landscapes intermix, have caused widespread destruction of homes, respiratory problems for residents, and loss of lives. One of the latest devastating wildfires in the US was the Los Angeles fires in California in 2025, resulting in significant casualties and structural damage. The increasing impact of these wildfires on daily life stems from prolonged dry seasons, global warming, and suboptimal fire codes and standards; therefore, there is an urgent need to understand the dynamics of wildfire propagation to develop advanced numerical models capable of predicting the wildfire propagation accurately and to improve strategies and standards to minimize the risks associated with these disasters. Firebrand generation is a critical factor in wildfire propagation and is notoriously challenging to control. Despite its significance, the mechanism behind firebrand generation remains inadequately understood. Additionally, the ignition of WUI fuels can undergo both smoldering and flaming combustion modes. Under specific environmental conditions, a transition from smoldering to flaming (StF) combustion can occur, exacerbating the complexity of wildfire management. Smoldering and flaming combustion are pivotal in understanding wildfire dynamics, and their emission characteristics can differ significantly. Investigating the mechanisms and factors governing StF transitions is essential to improve our ability to predict and control wildfires in WUI areas and to understand their emission characteristics, ultimately contributing to enhanced wildfire management and community safety. This presentation will discuss the role of firebrand generation in the propagation of wildfires at the WUI as well as the smoldering and StF transition of WUI fuels and their emissions, providing insights into these critical aspects of wildfire dynamics.

Brief Bio: Dr. Mohammadhadi (Hadi) Hajilou is an Assistant Professor of Mechanical Engineering at the University of Portland (UP). Prior to joining UP in 2022, he held postdoctoral researcher positions at the Berkeley Fire Research Laboratory at the University of California, Berkeley, Missouri University of Science and Technology (where he also served as a lecturer), and the University of Maryland, College Park. His research interests span the utilization of combustion for fire safety, emissions, and clean energy generation. His recent research work, funded by the National Institute of Standards and Technology (NIST), has focused on understanding the roots of wildfires at the Wildland Urban Interface (WUI) in the U.S. and globally, as well as characterizing emissions from WUI fuels under various environmental conditions.