Boulder Fluid and Thermal Sciences Seminar Series

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2:00—3:00 PM
MCEN Conference Rooms ECME 137A/B in the Engineering Center
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Modeling the dynamical coupling between wildland fires and atmospheric hydrodynamics

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Experiments and observations have demonstrated that the two-way feedbacks between fires and atmosphere play critical roles in determining how fires spread or if they spread. Advancements in computing and numerical modeling have generated new opportunities for the use of models that couple process-based wildfire models to atmospheric hydrodynamics models on high performance computing (HPC) platforms. These process-based coupled fire/atmosphere models, which simulate critical processes such as heat transfer, buoyancy-induced flows and vegetation aerodynamic drag, are not practical for operational faster-than-real-time fire prediction due to their computational and data requirements. However, they do serve critical role as they help increase our understanding of wildfire phenomenology, complement experiments, add perspective to observations, and generate new hypothesis that can be tested experimentally. These HPC-based models can also provide critical insights for the development of faster running coupled fire/atmosphere model that can be used for training, ensemble calculations and eventually operations. One requirement that has been identified for any such future model that is intended for broad wildland fire applications (wildfire and prescribed fire) is that it represents the coupling between the fire and the atmosphere.

Biography: Dr. Rodman Linn began his career in the field of theoretical turbulence modeling in Los Alamos National Laboratory's Theoretical Fluid Dynamics group in 1990 working with Dr. Francis Harlow. This work provided the foundations for Dr. Linn's research in the area of wildfire modeling, which began in 1995. Since then, one of his focus areas has been coupled fire/atmosphere behavior. For over two decades he has served as principal investigator for a process-based coupled fire/atmosphere model, FIRETEC. Dr. Linn continues to use next-generation process-based wildfire models for the study of fundamental wildfire behavior, evaluation of prescribed fire tactics, understanding influences of complex environmental conditions on fire behavior, risk assessment for critical facilities and wildfire's interaction with other landscape disturbances such as insects or drought. Dr. Linn also applies numerical models to study a variety of other near-surface atmospheric-related phenomena including wind energy, dispersion and ecosystem dynamics, which are impacted by the interaction between the atmosphere and surface vegetation though aerodynamic drag and energy balances.