Title: Using a coupled fire-atmosphere model to simulate smoke impacts on urban air quality

Presenting Author: Derek V. Mallia (Derek.Mallia@utah.edu), Research Assistant Professor, University of Utah
Coauthors: Adam Kochanski (San Jose State University), Kerry Kelly (University of Utah), and Tristalee Mangin

Abstract:
It is suspected that increasing wildland fire activity caused by climate change is deteriorating air quality across the Western U.S. Wildland fires emit many pollutants such as fine particulates and chemical precursors for ozone (O_3) formation. The chemical formation of O_3 during smoke events is poorly understood as many factors control O_3 production such as the type and amount of fuel being burned, availability of nitrogen oxides and volatile organic compounds, and smoke shading effects. A high-density air quality network located in Salt Lake City (SLC) combined with model analyses generated by a coupled fire-atmosphere model (WRF-SFIRE) is used to explore how urban emissions interact with smoke to form O_3. Coupled fire-atmosphere models such as WRF-SFIRE can explicitly resolve many of the underlying physical and chemical processes that governs smoke transport. This study also investigates how mountain meteorology interacts with smoke plumes as these interactions can be difficult to forecast with traditional weather prediction models. This work examines two distinctly different wildfire smoke episodes in SLC where the first episode was associated with smoke that originated from a local wildland fire, while the second smoke episode was likely caused by distant regional wildland fires. Preliminary results indicate that WRF-SFIRE can skillfully simulate smoke transport for the local and regional case study when evaluated with air quality stations.