Proceedings of 3rd Fire Behavior and Fuels Conference, October 25-29, 2010, Spokane, Washington, USA
Published by the International Association of Wildland Fire, Birmingham, Alabama, USA

Modern Developments for Ground-based Monitoring of Fire Behavior and Effects

Colin C. Hardy [A], Robert Kremens [B C], Matthew B. Dickinson [A]

[A] USDA Forest Service
[B] Rochester Institute of Technology
[C] Corresponding author, Email: kremens@cis.rit.edu

Abstract
Advances in electronic technology over the last several decades have been staggering. The cost of electronics continues to decrease while system performance increases seemingly without limit. We have applied modern techniques in sensors, electronics and instrumentation to create a suite of ground based diagnostics that can be used in laboratory (~ 1 m^2), field scale (~ 100 m^2) and landscape scale (10^6 m^2) experiments. These sensor suites are inexpensive, compact, and lightweight and measure relevant physical fire behavior measurable like fire power, total energy release, mass flow (3-D, vector), weather (wind speed, direction, relative humidity and air temperature) and gas concentration. The instruments are small and inexpensive enough that many can be deployed by a small crew during a fire experiment to provide a better understanding of fire behavior (through a better spatial understanding) than could be obtained with only one or two instruments. The sensors employ low cost opto-electronic components, micro-electromechanical systems (MEMS), electrochemical gas sensors, ultra-low power microprocessors and high density circuit layouts to meet cost and weight goals.

These instruments have been deployed in prescribed and wild fires dozens of times on fires in the Eastern and Western United States. We will discuss the design and performance of the present versions of these instruments, and speculate about the future, where we envision hundreds of such instruments scattered throughout the fire to obtain a synoptic understanding of the fire event.