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| **Connecting Fuels and Fuel condition to Site-level Fire Energy Sensing** |
| **Introduction:**  Wildland fire behavior and emissions are highly dependent on the type, arrangement, and condition of the fuels that are burning. Fuel conditions are a primary factor in driving fire energy and the progression across the landscape and spread of fire though a site. Additionally, large discrepancies between different model-based estimates of carbon and pollutant production in current smoke emission inventories are the result of broad assumptions regarding what is burning and under what conditions. In this study, we have used advanced in-situ fire energy sensing to consider the influence of fuels on fire energy signatures.  **Methods:**  We have aggregated fine-scale fuel, consumption, and fire radiative power (FRP) estimates associated with prescribed surface fires to the scale of trees, forest stands, and management units. Radiometry data of active fire was collected at several prescribed burns across the United States (US) coincident with detailed fuels consumption measurements. The data were collected with a variety of nadir-viewing dual-band and five-band radiometers distributed across a statistical sampling of fuel types and densities. The radiometers were calibrated with laboratory blackbody data to derive sensor response models that allowed FRP retrievals. The integrated FRP data was used to derive fuel consumption estimates that were compared with values derived from pre- and post-fire fuels measurements.  **Results:**  Preliminary results indicate the radiometrically and clip-plot derived fuel consumption estimates often show good agreement, although they are sensitive to the statistical sampling of different fuel sizes and assumptions about the radiative fraction of the total combustion energy. We will discuss complications arising from the fuel sampling procedure and its impact on consumption estimates. We will also describe preliminary attempts to measure convective heat flow co-located with the radiometry measurements, in an attempt to reduce the uncertainties about the total heat budget.  **Conclusions:**  From local to global scale, remote sensing has become an indispensable tool for monitoring fire and its effects. Connecting remote measurements of fire energy to fuel characteristics provides fundamental data on the influence of fuels and their condition on fire behavior and emissions. |