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Pyrogenic carbon produced during FIREX

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In October 2016 the first laboratory phase of the Fire Influence on Regional and Global Environments Experiment (FIREX) took place at the USDA Fire Sciences Laboratory (Missoula, Montana, US). A range of fuel types representative of the most-fire prone ecosystems in US were burnt and their emissions extensively monitored. A total of 107 fuel beds (1X1m) were burnt, with the first 75 fires being carried out as stack burns (online emission monitoring) and the final 32 as chamber burns (emissions monitored once the burn was complete and the chamber full of smoke).

In addition to the main atmospheric research carried out by different US research groups, we quantified the residues left after 21 of the chamber burns (i.e. unburnt fuels, charred fuels, charcoal and ash). We then analysed their inorganic and organic carbon contents, as well as total nitrogen, hydrogen, oxygen and sulphur contents. Elemental analyses for the pre-fire fuel components were also performed. These data allowed us to estimate budgets for carbon and other elements for these fires. For carbon, it was calculated how much of the pre-fire fuel carbon was emitted, how much was unburnt and how much was converted to pyrogenic carbon (i.e. chemically modified during fire). From this, the rates of pyrogenic carbon production [% pyrogenic carbon (PyC) / burnt carbon (BC)] were also calculated. PyC production varied, with little (<5% PyC/BC) produced from fuels when combustion was very complete (e.g. some of the chaparral fuels), but more than 20% PyC/BC for some mixed coniferous fuels. In this presentation we will present these results and discuss the representativeness of the PyC produced during FIREX for real vegetation fires.