Geophysical Research Abstracts,
Vol. 12, EGU2010-34, 2010
EGU General Assembly 2010

Investigation of Spread dynamics, Carbon emissions and Suppression Efficiency of smouldering coal fires using small-scale experiments

Rory Hadden, Jose Garcia Saez, and Guillermo Rein
University of Edinburgh, BRE Centre for Fire Safety Engineering, Edinburgh, United Kingdom (G.Rein@ed.ac.uk)

Coal fires are driven by smouldering which is defined as a
slow, low temperature flameless form of combustion sustained by the heat evolved when oxygen directly attacks the surface of a condensed fuel.

Once these fires have been ignited, they are difficult to detect, locate and extinguish. Despite extensive fire-fighting attempts in hundreds of cases around the globe, very few cases of successful extinction by human intervention have been confirmed.

This work reports two sets of small-scale laboratory experiments that have been used to investigate ignition, spread, emissions and suppression of coal fires.

The combustion reaction was characterised by reaching maximum temperatures of 700-1000 C with an average spread rate of 0.11 mm/min.

A repeatable coal fire is defined in the smouldering apparatus and suppression is attempt after 300 min of free burning. The effectiveness of three water suppression methods is investigated (pipe,shower, and spray). Water was identified as a good extinguishing agent and it is shown that significant differences in extinguishing efficiency arise from different methods. The amount of water required was measured to be on the order of 1 to 2 litres of water per kg of burning coal.

The CO and CO2 emissions are measured using a fire propagation calorimeter and mass flow, yields and the CO to CO2 ratio are reported as a function of the burning conditions.

These experiments aim to provide a fundamental step into the understanding of subsurface fires, asses their impact in global emissions and find the best method to extinguish them.