Geophysical Research Abstracts
Vol. 15, EGU2013-8338, 2013
EGU General Assembly 2013

Impact of fire on macropore flow and the hydraulic conductivity of near-surface blanket peat

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Peatlands can be subject to wildfire or deliberate burning in many locations. Wildfires are known to impact soil properties and runoff production in most soil types but relatively little work has been conducted on peatlands. Furthermore in large parts of the UK uplands prescribed vegetation burning on peat has taken place at regular intervals (e.g. every 8-25 years) on patches of around 300-900 sq. metres over the past century to support increased grouse populations for sport shooting. However, there have been few studies on how these prescribed fires influence near-surface hydrology. It is known that macropores transport a large proportion of flow in near-surface peat layers and we investigated their role in flow transport for fire sites using tension infiltrometers. Measurements were performed, at replicated hillslope positions to control for slope position effects, on unburnt peat (U) and where prescribed burning had taken place two years (P2), four years (P4) and >15 years (P15+) prior to sampling. For the prescribed burning plots, vegetation burning had also occurred at around a 15-20 year interval for most of the past century. We also sampled a nearby wildfire site (W) with the same sampling design where wildfire had occurred four months prior to sampling. Both the contribution of macropore flow to overall infiltration, and the saturated hydraulic conductivity, were significantly lower in the recently burnt sites (W, P2, P4), compared to P15+ and U. There was no significant difference in macropore flow contributions, effective macroporosity and saturated hydraulic conductivity between P15+ and U. The results suggest fire influences the near-surface hydrological functioning of peatlands but that 'recovery' for some hydrological processes to prescribed vegetation burning may be possible within two decades if there are no further fires.