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Characterizing the propagation of smouldering fires under the influence of heterogeneous moisture distributions in peat fires

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Smouldering is a slow, flameless form of combustion affecting soil layers with high organic matter content (e.g. peat, humus, duff). Smouldering fires are difficult to extinguish and can spread through soil layers for weeks and months. Such fires remove large quantities of soil, damage root systems and soil biota, cause habitat loss and release substantial carbon emissions. Moisture content distribution in organic soil layers is known to be one of the most important variables affecting combustion. In real systems soil moisture content has a heterogeneous distribution but the effects of the heterogeneity on the behaviour of the smouldering front propagation have not been studied. In this study we focus on characterizing the smouldering combustion of peat under different heterogeneous moisture contents. We present the results from a series of small-scale experiments (in a 20x20x5cm tray) looking at the effect of different moisture configurations on smoulder spread rate and burn duration. We contrast burns undertaken un both heterogeneous and homogeneous moisture distributions in order to compare the influence on the propagation behaviour of smouldering fires. We then fit this data to a cellular automaton model of smouldering propagation (FIREOX3) and will discuss the preliminary findings.