

Deep peat fire persistently smouldering for weeks: a laboratory demonstration

ABSTRACT

Background. Peatlands are becoming more vulnerable to smouldering fires, driven by climate change and human activities. Aims. This work explores the persistent burning, propagation, and emission of the deep peat fire. Methods. Laboratory experiments are conducted with a 1-m deep peat column, and smouldering fires are initiated at different depths. Key results. We found localised burning and multi-directional smouldering fire spread in deep peat layers. The smouldering temperature first decreases with depths up to -40 cm (from around 550 to 350°C) and then remains at about 300°C in the deeper layers. High moisture content can slow down in-depth fire propagation and reduce the burning duration. Conclusions. Peat fire can burn in deep layers for weeks, and its combustion is incomplete with small mass loss, because of a limited oxygen supply and low smouldering temperature. Measuring the carbon monoxide concentration near the surface can detect underground fire and monitor its intensity. Implications. This work helps reveal the underlying mechanism of the in-depth smouldering wildfires in peatland and supports future larger-scale peat fire experiments in the field.