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Abrupt increase in Arctic-Subarctic wildfires following permafrost thawing in a warmer climate

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Greenhouse warming is accelerating permafrost thaw and the risk of wildfires in the northern high latitudes. However, the impact of permafrost thaw on Arctic-Subarctic wildfires and the associated release of greenhouse gases and aerosols is less well understood. Here we investigate the effect of future permafrost thaw on Arctic-Subarctic wildfires using the CESM2 large ensemble simulations forced by the SSP3-7.0 greenhouse gas emission scenario. We find that an increase in soil permeability induced by rapid permafrost thawing leads to an abrupt increase in sub-surface runoff and a decrease in soil moisture over the Arctic-Subarctic region. This sudden soil drying causes a significant increase in surface air temperature and a decrease in relative humidity during summer. The resulting soil drying and atmospheric dryness lead to a rapid intensification of wildfires in western Siberia and Canada in the mid-to-late 21st century.