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Response: Data sets and model code have been archived on Zenodo with assigned DOI, which has been included in the *Code and data availability* section.

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Response: Below is the short summary.

The study introduces TSECfire v1.0, a hierarchical error-correcting machine learning framework for predicting extreme boreal peatland fires. It emphasizes the dominant role of temperature and air dryness in BP fires, surpassing precipitation, wind speed, and human activities in inducing peatland fires. The study's unique approach lies in its two-step error-correcting framework, achieving over 80% accuracy in predicting rare and extreme fire occurrences and fire sizes. The paper also discusses two fire mechanisms that are with- and without frozen-thaw effects in understanding smoldering fires.