

Climate change threatens permafrost in soil

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In the coming century, permafrost in polar regions and alpine forests in the Northern Hemisphere may thaw rapidly, potentially releasing carbon and nitrogen that could cause additional regional warming. Permafrost occurs in soils where ground temperatures remain below freezing for at least two consecutive years. These special types of soil, called Gelisols, are large reservoirs of organic carbon and nitrogen. Thawing is likely to release the carbon and nitrogen in these soils to rivers and lakes, ecosystems, and the atmosphere; different soil types are vulnerable to different thawing processes.

There is field evidence that permafrost cover has been moving poleward since around 1900. Scientists predict that of the many ways permafrost can thaw, "top-down" and "lateral thawing" will be the most dominant modes of degrading permafrost. Harden et al. compiled a database of published and unpublished carbon and [nitrogen content](#) from a variety of Gelisols. Using predictions of [soil temperature](#) in the climate model CCSM4, the authors studied the role of top-down thawing processes in degrading several types of Gelisols under future [climate scenarios](#).

They find that forest fires and thawing-related decomposition of different types of Gelisols would take place over the next century, which could potentially release up to 850 billion tons of carbon and up to 44 billion tons of nitrogen into atmosphere-water and high-latitude ecosystems. The authors recommend combining extensive field and model studies, such as theirs, to understand the impact of permafrost thawing on global and regional climate by the middle of this century.

More information: Field information links permafrost carbon to physical vulnerabilities of thawing, *Geophysical Research Letters*, [doi:10.1029/2012GL051958](https://doi.org/10.1029/2012GL051958) , 2012

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