CLIMATOLOGY

Permafrost thawing puts the frozen carbon at risk over the Tibetan Plateau

Taihua Wang[1], Dawen Yang[1]*, Yuting Yang[1]*, Shilong Piao[2], Xin Li[3,4], Guodong Cheng[5,6], Bojie Fu[7]

Soil organic carbon (SOC) stored in permafrost across the high-latitude/altitude Northern Hemisphere represents an important potential carbon source under future warming. Here, we provide a comprehensive investigation on the spatiotemporal dynamics of SOC over the high-altitude Tibetan Plateau (TP), which has received less attention compared with the circum-Arctic region. The permafrost region covers ~42% of the entire TP and contains ~37.21 Pg perennially frozen SOC at the baseline period (2006–2015). With continuous warming, the active layer is projected to further deepen, resulting in ~1.86 ± 0.49 Pg and ~3.80 ± 0.76 Pg permafrost carbon thawing by 2100 under moderate and high representative concentration pathways (RCP4.5 and RCP8.5), respectively. This could largely offset the regional carbon sink and even potentially turn the region into a net carbon source. Our findings also highlight the importance of deep permafrost thawing that is generally ignored in current Earth system models.

INTRODUCTION

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RESULTS

Permafrost and ALT distribution

SOC distribution

(24, 26, 27)

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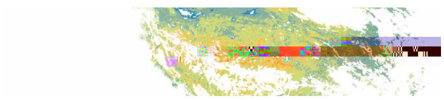

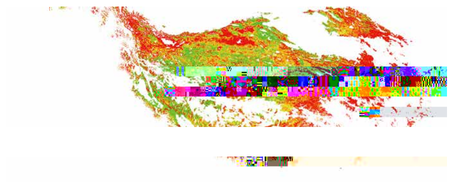

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Permafrost carbon dynamics under future climate

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DISCUSSION

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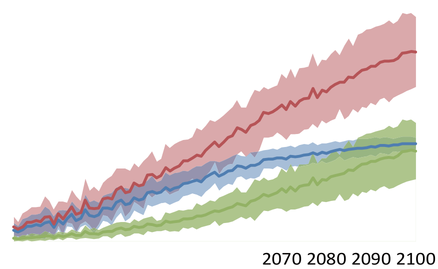

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MATERIALS AND METHODS

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Data-driven mapping of MAGT and ALT

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SUPPLEMENTARY MATERIALS

Supplementary material for this article is available at http://advances.sciencemag.org/cgi/content/full/6/19/eaaz3513/DC1

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Science Advances

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