Groundwater flow accelerates permafrost degradation on the Qinghai-Tibet Plateau

February 17 2023, by Li Yuan

Yellow River at Guide, Qinghai. Credit: Jucember/Wikimedia Commons, CC BY-SA

Climate warming and permafrost thawing on the Qinghai-Tibet Plateau (QTP) have changed the distributive features of permafrost, which leads

to alterations in soil moisture and permeability, and exerts profound impacts on groundwater flow regimes on the QTP.

Recently, a joint research team from the Northwest Institute of Eco-Environment and Resources of the Chinese Academy of Sciences (CAS), Lanzhou Jiaotong University and Northeast Forestry University simulated the concordant permafrost evolution and groundwater flow in responses to a warming climate at time scales of decades to centuries.

Their findings were published in *Hydrogeology Journal* on Feb. 13.

The researchers used seven scenarios of different hydraulic conditions for modeling and analysis to quantitatively evaluate effects of groundwater movement on thermokarst lakes in discontinuous permafrost areas.

They found that the presence and movement of groundwater and the deeper subpermafrost aquifer could substantially accelerate permafrost degradation, and the disappearance of residual permafrost at depth could result in the sudden establishment of deep groundwater flow paths. All hydrological impacts will become evident after the stabilization of the hydrothermal and flow fields in the coming 100 to 200 years.

In addition, the modeling results demonstrated that flow velocity and discharge rate in local groundwater flow systems could be enhanced by an increased hydraulic conductivity, leading to an accelerated degradation of isolated permafrost bodies.

More information: Shuhui Gao et al, Analysis of groundwater flow through low-latitude alpine permafrost by model simulation: a case study in the headwater area of Yellow River on the Qinghai-Tibet Plateau, China, *Hydrogeology Journal* (2023). DOI: 10.1007/s10040-023-02597-7

Provided by Chinese Academy of Sciences