The effect of permafrost area and types on flux and composition of dissolved organic matter in stream from alpine catchments, northeastern Qinghai-Tibet Plateau

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Understanding optical characteristics, composition and source of dissolved organic matter (DOM) in rivers is important for region and global carbon cycle, especially in the inland rivers of the Qinghai-Tibet Plateau. In order to understand the impact of permafrost degradation on river DOM output under the background of climate warming, we selected 34 typical sub-basins in the upper reaches of the Heihe River basin on the Qinghai-Tibet Plateau according to the different proportion of permafrost area in the basin. Water samples were collected at the outlet of each sub-basin in October 2018, January, April and July 2019, respectively. The variations of DOM structure and source identification in different permafrost basin were investigated using UV-visible absorbance and fluorescence spectroscopy. The results showed that: (1) The concentration of C1 and C2 components and the values of SUVA₂₅₄, HIX and FI increased with the decrease of the percentage of permafrost area, indicating that with the degradation of frozen soil, the runoff path deepens, and more terrestrial organic matter is dissolved into the water body, which increases the terrestrial DOM in the river water, which in turn leads to the increase of DOM concentration, humification degree and aromaticity; (2) As the proportion of permafrost area decreases, the SR value shows a decreasing trend, indicating that the DOM of rivers in permafrost regions has the characteristics of low molecular weight and low humic acid, while the DOM of rivers in seasonally frozen soil regions is the opposite, indicating a frozen soil Melting may lead to the increase of terrestrial DOM in river water, and the increase in the depth of freeze-thaw cycle may release aromatic substances containing fused ring structure in frozen soil, which will enter the river with runoff, resulting in increased aromaticity and molecular weight of DOM in river water; (3) The concentrations of C1 and C2 components are positively correlated with vegetation coverage, and vegetation coverage is negatively correlated with the percentage of permafrost area. It shows that the degradation of frozen soil will increase the coverage of vegetation, thereby increasing the DOM from terrestrial sources. This study shows that the optical characteristics, composition and source of DOM have important indications for the degradation of permafrost under the background of global warming.