Seasonal changes in runoff characteristics in an permafrost watershed of Qinghai-Tibet plateau

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The discharge from rivers of the high altitude but low latitude permafrost regions have changed significantly due to global change, whereas its mechanism is not well known. The possible factors are vegetation change and active layer soil freeze-thaw cycle, which may influence the runoff in the variations of water and heat cycle processes. In this study, a typical permafrost watershed in Qinghai-Tibet plateau was selected, its hydrological processes were monitored from 2004-2007. The Principal Component Analysis (PCI) and statistical regression methods were used to analyse the impact factors of the surface runoff processes during different stages. Typical thawing of ice and snow flood is the main flood type in spring flood stage owing to thawing of active layer and snow melting, and soil temperature and moisture above 65 cm plays a leading role in this period. However, the precipitation flood are the main flood type in the summer flood stage in virtue of precipitation, the key impact factors are precipitation and deep soil temperature. The spring discharge increased with the increasing of air temperature, however, the summer discharge decreased. Therefore, we forecast that global warming may lead to greater flood in spring and lower flood in summer, result in weakening of eco-hydrological function and runoff generation ability. In addition, the active soil thawing from the surface to depth of 60 cm had contributed to increase in discharge, but the increase in thawing depth deeper than 60 cm led to a decrease in surface runoff.