



Investigation of Streamflow Pathways in Two Alpine Catchments on the Tibetan Plateau

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Streamflow pathways in two alpine catchments, i.e. the bigger and lower Binggou catchment and the smaller and higher Yakou catchment, were investigated based on water samples collected from different water bodies during spring snowmelt period (SSP) and summer rainfall period (SRP). The stable isotope two-component mixing model results indicated that contribution of old water dominated the Binggou streamflow during both SSP and SRP. However, contribution of new water and old water dominated the Yakou streamflow during SSP and SRP, respectively. The difference between the two catchments was potentially due to the later thawing of frozen soil and the less soil water buffering capacity in the Yakou catchment in spring. The hydrochemical End-Member Mixing Analysis further illustrated the dominant contribution of middle-slope surface flow and shallow sub-surface flow to spring and summer streamflow, respectively, in both catchments. It was indicated that the streamflow was promoted by the underlying impermeable freezing front following “fill and spill” mechanism. Overall, the investigation demonstrated the controlling role of soil freezing-thawing on the streamflow generation processes in the alpine catchments.