

Climate elasticity of annual runoff: observation in fifteen forested catchments on a latitudinal gradient in east Asia

ABSTRACT

In order to overview the impact of climate change on runoff from forested catchments over Asian countries, we collected water balance data from fifteen long-term catchment monitoring stations (total monitoring period 1975–2018, not continuous), spanning from Sabah, Malaysia (our southernmost site), to Hokkaido, Japan (our northernmost site). We then employed an elasticity analysis to the dataset to examine how the annual runoff from each catchment responded to inter-annual fluctuations in annual rainfall and annual mean air temperature. As a result, we found that (1) the annual runoff was sensitive to annual rainfall for all the catchments examined. In addition, (2) the annual runoff from seven of the fifteen catchments was sensitive to inter-annual changes in the mean air temperature, which was likely due to changes in forest evapotranspiration. Three catchments, however, exhibited an increased runoff in a hot year. Finally, (3) the annual rainfall from the previous year (carry-over soil moisture) was important in explaining the variation in annual runoff in two tropical montane forest catchments. This study may serve as one of the pilot studies toward a comprehensive understanding of the climate elasticity of runoff in countries over Asia, because the examined catchments are unevenly and sparsely distributed over the area.