Geophysical Research Abstracts
Vol. 21, EGU2019-13430, 2019
EGU General Assembly 2019

Decline in catchment evapotranspiration due to forest maturity: another evidence from a Japanese catchment

Nobuaki Tanaka (1), Anand Nainar (1), Takanori Sato (1), and Aloys Greffard (2)

(1) Ecohydrology Research Institute, The University of Tokyo Forests, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Aichi, Japan, (2) École Nationale du Génie de l'Eau et de l'Environnement de Strasbourg, Strasbourg, France

It is well known that a logging/harvesting practice in a forested catchment induces evapotranspiration (ET) decline and a subsequent runoff increase. In addition, most previous paired-catchment studies have revealed that, after re-planting the same tree species in the logged catchment, the post-logging runoff increase gradually diminished and returned to pre-logging level within short time period (typically 5-15 years), due to increasing water use by the planted trees with their growths. However, there is relatively little information on how longer-term catchment water balance changes with maturity of trees in the catchment. Marc and Robinson (2007) is one the few studies, in which, based on long-term catchment water balance data in UK, they reported that ET reduced by 140 mm per year in spruce/pine catchments with increasing forest ages. In order to fill the knowledge gap further, we revisited long-term water balance data for a Japanese catchment in which the soil and vegetation had been disturbed due to forest overuse, until its establishment in 1929 by University of Tokyo. Initially, the catchment was covered by young pines with scattered denuded ridges. After the catchment establishment, the poor vegetation had gradually been matured and the scattered denuded ridges had been decreased particularly after 1960s. Because the matured pine trees in the catchment had been largely declined due to an epidemic (pine wilt disease) during 1980s, we examined annual loss of the catchment from 1930s to 1970s. The result showed that the annual loss decreased with the decades, i.e. pine maturing, by about 100-150 mm per year. A further event-basis water balance analysis (Linsley et al. 1982) showed that the decline in the annual loss was caused by ET decline in the mid-growing season while ET in the dormant season exhibited almost no change throughout decades. Though, in order to draw a solid conclusion, a further investigation is still needed considering fluctuations in meteorological factors (such as air temperature) controlling ET, we currently attribute the ET decline in the mid-growing season to age-related transpiration decline, as was found for maritime pine stands in France (Delzon and Loustau 2005), because canopy interception would be augmented in later decades due to larger above-ground biomass and leave amount.