Long-term discharge and evapotranspiration of a forested catchment in the Harz Mountains, Germany: evaluation of silvicultural adaptation strategies to climate change

HENNING MEESENBURG, JOHANNES SUTMÖLLER & SWEN HENTSCHEL

Northwest German Forest Research Station, Grätzelstr. 2, D-37079 Göttingen, Germany
henning.meesenburg@nw-fva.de

Abstract
Forests with their high surface area and forest management practices have an important impact on hydrological processes at the atmosphere–land interface. Since 1948, water fluxes have been studied in different compartments of the Lange Bramke catchment, Harz Mountains, Germany, which was completely clear-cut in 1947 and reforested with Norway spruce. The catchment is characterized by a humid climate. Water budgets for the period 1950–2008 have been simulated using the hydrological model WaSiM-ETH, which was coupled to a forest growth model for the estimation of stand characteristics. As adaptation options to climate change, the conversion from drought sensitive Norway spruce stands to less sensitive European beech and different thinning regimes have been simulated until 2050. Discharge of Lange Bramke has decreased since 1948 due to a combined effect of forest development and climatic changes. Tree transpiration will likely further increase until 2050 (due to projected climate change) resulting in higher risk of drought stress. Conversion of Norway spruce stands to European beech and intensified thinning would result in reduced drought stress and increased discharge.

Key words water budget; stand development; climate change; evapotranspiration; interception; Harz Mountains