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Preliminary study on long-term evapotranspiration from a forested watershed in relation to ambient air temperature

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Hydrological studies examining the effects of climate change on water cycling in forests have frequently used projected climate change scenarios and discussed forthcoming hydrological change in the forested areas. Thus, relatively less knowledge is available in discussing the effects of climate change in the past on forest hydrology. This study made preliminary comparison between 70-year annual mean air temperature (T_a) at a forest site and 80-year annual evapotranspiration (ET) from that site. The examined watershed was Shirasaka Watershed (SW), Seto, Aichi, Japan, where long-term data sets of T_a , rainfall, and runoff were available. Annual ET was determined from watershed water balance, assuming both of leakage loss to bed rock of the watershed and change in stored water within the watershed to be negligible. The T_a at SW seems to have no clear rising or declining trends by mid-1980s, but thereafter rose abruptly by c. 1°C , and remained such high T_a level to the present. This long-term T_a trend seemed similar to that being derived from data at remote stations of Japan Meteorological Agency (see <http://www.asahi-net.or.jp/~rk7j-kndu/kenkyu/ke45.html>). Annual ET was calculated at c. 830 mm y^{-1} and $>900\text{ mm y}^{-1}$, for the 1970-1987 period (before the abrupt T_a change) and the 1988-2009 period (after the abrupt T_a change), respectively. The increased ET in recent years might be caused the high T_a level and suggested enhanced water vapour exchange between SW and the atmosphere due to the recent warming.

Keywords: Forest watershed, Air temperature, Evapotranspiration, Long-term data set