Estimation of riparian zone evapotranspiration from diurnal groundwater patterns

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One of the most important challenge in hydrology today is establishing the relationship between hydrological and biological processes. Short periodical fluctuation of hydrological features like diurnal patterns of groundwater and groundwater-sustained stream baseflow (as an eco-hydrological phenomena) can be closely linked to water use by vegetation. Riparian vegetation (especially riparian forest ecosystems) typically has a great influence on groundwater level and groundwater-sustained stream baseflow.

Two versions, named empirical and hydraulic, of a new technique (an upgrade of the White [1932] method) were developed to calculate evapotranspiration rates from groundwater-level readings in the riparian zone. The method was tested with hydro-meteorological data from the Hidegviz Valley experimental catchment, located in the Sopron Hills region at the western border of Hungary.

Evapotranspiration rates of this new method compare favorably with the Penman-Monteith-derived values for the day at a 30-min resolution. On a daily basis the newly-derived evapotranspiration rates are typically 50% higher than the ones obtainable with the original White method. Sensitivity analysis showed that the more reliable hydraulic version of the new evapotranspiration-estimation technique is most sensitive to the value of riparian zone saturated hydraulic conductivity.

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