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Comment on Interference of River Level Changes on Riparian Zone Evapotranspiration Estimates from Diurnal Groundwater Level Fluctuations by Zhu et al.

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Discussion

Comment on "Interference of river level changes on riparian zone evapotranspiration estimates from diurnal groundwater level fluctuations" by J. Zhu, M. Young, J. Healy, R. Jasoni, J. Osterberg [J. Hydrol. 403(3–4) (2011) 381–389]

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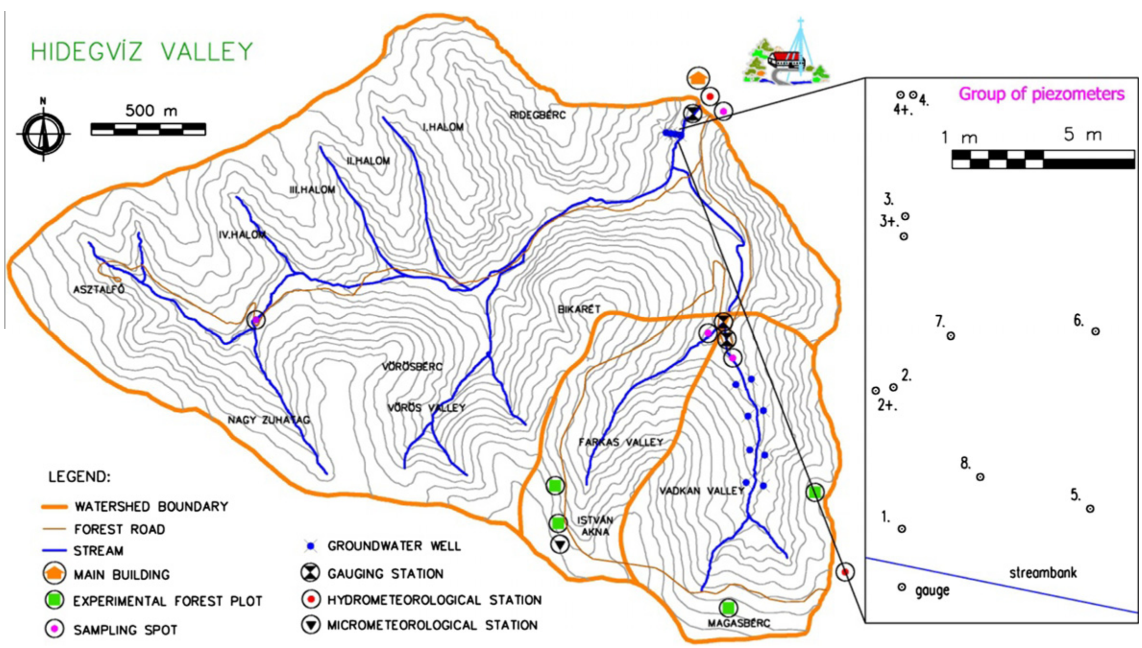

Fig. 1. The experimental catchment and the location of the groundwater wells [after Gribovszki et al. (2008)].

Zhu et al. draw the attention to the importance of considering stream water level fluctuations as a complicating factor in estimating diurnal evapotranspiration rates by riparian/phreatophyte vegetation from groundwater level fluctutations. To justify their analysis they cite the studies of Gribovszki et al. (2008) and Szilagyi et al. (2008) among other works. While Zhu et al.'s analysis of the interaction of streamwater and groundwater level fluctuations is definitely justified for streams that are influenced by streamwater/groundwater pumping and/or flow releases (the Colorado River below Hoover Dam is a good example), we would like to point out that in smaller streams unaffected by human interference, such interactions may largely be negligible as diurnal water level changes in the stream are significantly damped in comparison with the corresponding groundwater level changes, as can be demonstrated in the watershed discussed by Gribovszki et al. (2008).

The Hidegviz Valley catchment (Fig. 1) is a small forested watershed (6 km^2) within the hilly sub-alpine terrain of western Hun-

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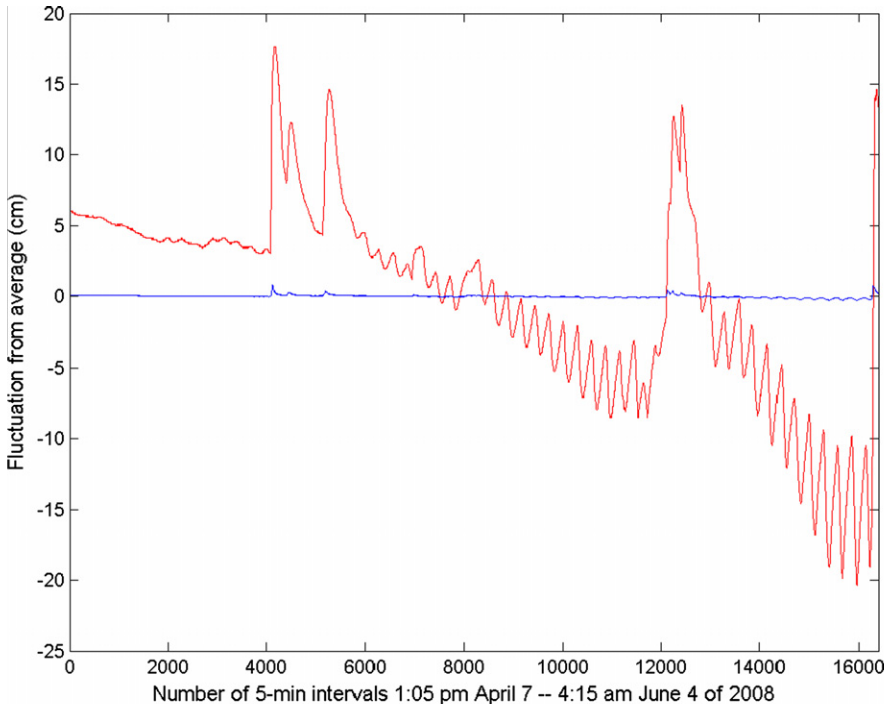

Fig. 2. Water level changes in the stream (smooth line) and in the groundwater well 9.4 m from the stream (well #2 in Fig. 1). The largest fluctuations are caused by rain events.

gary near the border of Austria. For more detailed characteristics of the site see Gribovszki et al. (2008). The watershed may be a propotype of other small forested catchments of similar physiography under a continental climate. As Fig. 2 illustrates, diurnal streamwater level fluctuations are vastly negligible to the corresponding changes in groundwater level, obtained in a well 9.4 m from the stream. For clarity of presentation, groundwater level fluctuations only in this well are shown, the fluctuations are similar in magnitude in the other well locations of Fig. 1, and all are at least an order of magnitude larger than the corresponding fluctuations is stream water level. This is a welcome news to the application of observed diurnal groundwater level fluctuations for the estimation of riparian/phreatophyte evapotranspiration rates in catchments with no or minor anthropogenic influence, since the resulting estimates are not adversely affected by the distance to the stream, as on the site, discussed by Zhu et al. Without taking away from the importance of their study, we felt it necessary to point out that the problem they discuss is not general, although probably widespread due to the degree humans interfere with the hydrologic cycle. Yet, there remain as many small watersheds not yet influenced by such activities where similar concerns do not enter into the analysis of diurnal groundwater level fluctuations for the estimation of riparian/phreatophyte vegetation water use, as is the case for the study of Gribovszki et al. (2008).

References

Gribovszki, Z., Kalicz, P., Szilagyi, J., Kucsara, M., 2008. Riparaian zone evapotranspiration estimation from diurnal groundwater level fluctuations. J. Hydrol. 349 (1–2), 6–17.

Szilagyi, J., Gribovszki, Z., Kalicz, P., Kucsara, M., 2008. On diurnal riparian zone groundwater level and streamflow fluctuations. J. Hydrol. 349 (1–2), 1–5.