Hydrology and Earth System Sciences

Corrigendum to

"A distributed stream temperature model using high resolution temperature observations" published in Hydrol. Earth Syst. Sci., 11, 1469–1480, 2007

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In our publication Westhoff et al. (2007), a typographic error was propagated, which was first seen in Boyd and Kasper (2003), and showed up in our Eq. (14). The correct equation is:

$$\Phi_{\text{atmospheric}} = 0.96 \, \varepsilon_{\text{atm}} \, \theta_{\text{VTS}} \, \sigma_{\text{sb}} \, (T_{\text{air}} + 273.2)^4. \qquad (1)$$

With this notation, the total incoming longwave radiation is computed to be the weighted average of atmospheric longwave radiation and land cover radiation (Eq. 19 of Westhoff et al., 2007), where θ_{VTS} determines their weights. The only difference between the Eqs. (14) and (19) is the emissivity, ε, which has a value of 0.96 for land cover longwave radiation and has a value <0.96 for ε_{atm}.

Though once calibrated this change does not affect the quality of fit to observations, the correction restores physical interpretation of the parameters. Specifically, in the original formulation, there was a double counting of incoming longwave radiation, which resulted in a large (calibrated) value for θ_{VTS} (of the order of 0.9) to achieve land cover longwave radiation within the correct range. With the correct formula, θ_{VTS} will have the desired physical meaning, and therefore would be amenable to independent measurement in the field. It bears noting that regardless of the correction, greater vegetation is still predicted to give rise to more incoming longwave radiation, since ε_{atm} is always smaller than 0.96.

References:

Boyd, M. and Kasper, B.: Analytical methods for dynamic open channel heat and mass transfer: methodology for the Heat Source Model Version 7.0, Watershed Sciences Inc., Portland, OR, USA, found at: http://www.heatsource.info/HeatSourcev7.0.pdf, 2003.

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