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Hydrology and Earth System Sciences
Discussions

# *Interactive comment on* "Assessment of open thermodynamic system concepts for fluviokarst temperature calculations – an example, the Cent-Fonts resurgence (Hérault, France)" *by* P. Machetel and D. A. Yuen

**Anonymous Referee #1**

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I have read the reply of the authors and would like to comment on a couple of issues:

some references to stream temperature models are:

Brown, G. W., 1969. Predicting temperatures of small streams. Water Resour. Res. 5 (1), 68–75.



Kim, K. S., Chapra, S. C., 1997. Temperature model for highly transient shallow streams. J. Hydraul. Eng. 123 (1), 30–40.

Sinokrot, B. A., Stefan, H. G., 1993. Stream temperature dynamics:Measurements and modeling. Water Resour. Res. 29 (7), 2299–2312.

Boyd, M., Kasper, B., 2003. Analytical methods for dynamic open channel heat and mass transfer: Methodology for heat source model Version 7.0. Oregon Department of Environmental Quality, Portland, Oregon, http://www.heatsource.info/HeatSourcev7.0.pdf.

Becker, M. W., Georgian, T., Ambrose, H., Siniscalchi, J., Fredrick, K., 2004. Estimating flow and flux of ground water discharge using water temperature and velocity. J. Hydrol. 296 (1-4), 221–233.

Roth, T. R., Westhoff, M. C., Huwald, H., Huff, J. A., Rubin, J. F., Barrenetxea, G., Vetterli, M., Parriaux, A., Selker, J. S., Parlange, M. B., 2010. Stream temperature response to three riparian vegetation scenarios by use of a distributed temperature validated model. Environ. Sci. Technol. 44 (6), 2072–2078.

Westhoff, M. C., Savenije, H. H. G., Luxemburg, W. M. J., Stelling, G. S., van de Giesen, N. C., Selker, J. S., Pfister, L., Uhlenbrook, S., 2007. A distributed stream temperature model using high resolution temperature observations. Hydrol. Earth Syst. Sci. 11 (4), 1469–1480, http://www.hydrol-earth-syst-sci.net/11/1469.

And several references herin.

Regarding point 3a:
$C_p$ does not describe the storage of heat, but is a conversion factor to convert temperature into energy. Storage of heat is described as a $V_i T_i$ (eventually multiplied with $\rho C_p$ to have units in terms of energy). In Eq 3, a change in storage over time ($V\Delta T/\Delta x$) should equal the sum of $Q_{in}T_{in}$ minus the sum of $Q_{out}T_{out}$.

Regarding point 3c:
The LHS has units: [m/s][K]/[m] = [K/s]
The RHS has units: [$m^2$/s][K] = [$m^2$K/s]

Regarding points 3d-f:
After having read the text in the manuscript again, I see that the authors are right. Nevertheless, to avoid this confusion, I recommend to give the normalized parameters a different symbol such as e.g. $T_{normalized}$ or add the normalization in the formula e.g. $T/\Delta T_{max}$.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 169, 2014.