Hydrol. Earth Syst. Sci. Discuss., 12, C231–C233, 2015
www.hydrol-earth-syst-sci-discuss.net/12/C231/2015/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "How effective is river restoration in re-establishing groundwater – surface water interactions? – A case study" *by* A.-M. Kurth et al.

N. van de Giesen (Referee)

n.c.vandegiesen@tudelft.nl

Received and published: 19 February 2015

Review HESSD-12-1093-2015

General The authors present a clear and concise description of the application of Distributed Temperature Sensing (active & passive) to examine the effects of river restoration works. For reference, more and less natural streams were monitored as well. Rn-222 measurements supplemented the DTS.

Major comments In general, the article is clear but I have a question about the active method. It is stated that only temperatures in the range from 15.9 to 16.1 were used.

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The argument is that you do not want a large impact of the actual cable temperature on the cooling rate. However, the cooling rate does not only depend on cable temperature and flux but also on the temperature of the water flowing around the cable. The measurements do indicate a loosing stream but temperatures of the water in the stream differed along the cable. Would it not make more sense then to look at moments when the temperature difference between the cable in the streambed and the cable in the stream were the same at a given spot?

Minor comments Material & methods: Please provide information on the DTS and cable used. Also, for other experimenters, it would be good to know how much energy was used for how long to heat the cable.

Material & methods: The temperature diagrams seem a bit noisy. Could you say something about the calibration method used and the signal processing? Were the temperatures produced by the machine taken or was additional processing performed? Where does the 0.1 C accuracy/resolution come from?

p 1097 l 23: It is suggested that the elastic backscatter is Stokes backscatter but this is not the case. The elastic backscatter is called Rayleigh scatter and is not used in DTS. There is also Brillioun scatter, also not used in (this type of) DTS. The type of backscatter used in DTS is Raman backscatter, which does consist of two components, Stokes and anti-Stokes, which are both inelastic. Stokes is red-shifted and not very sensitive to temperature. Anti-Stokes is blue-shifted and rather sensitive to temperature. The ratio of the two then does indeed give the temperature signal.

p 1098 l 1: In general, it has not simply been assumed that cables take on the temperature of the surrounding medium. Lab tests have shown that the effect of the cable's thermal mass is negligeable in applications as the one presented here (delays of seconds). If I remember correctly, the Tyler reference can be used to support this statement.

p 1098 l 16: Not sure why it is stated here that: "Thereby, the temperature resolution

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was 0.1 C"

p 1104 l 10: This is a rather unclear statement. The "these results" is definitely confusing, especially how they can lead to the possible conclusion that there may be large scale upwelling, which is then later shown not to be the case. Probably better not to confuse the reader and simply go straight for the correct conclusion that there is no sign of large scale infiltration. Perhaps also mention that the active method does not say anything about the direction of the flux.

p 1105 l 16-20: This is not a clear sentence. There is no clear agent etc. Please re-write/break into two sentences.

p 1105 l 16-24: This is a bit over-enthusiastic: Only in one gravelbed was increased infiltration detetcted.

p 1105 l 25-28: This is rather weak: If we can simply assume gravel beds are great then this study is superfluous. I would leave this out.

In the Discussion, the active DTS results are not used at all but they do pop-up (a bit over-enthusiastically) in the Conclusions. I would suggest to include this in the Discussion as well. For example, there are several gravel islands but only one shows increased seepage. Why?

In the Conclusions / further research it may be good to point out that it would be possible to say something about the actual flux sizes with additional analysis.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 12, 1093, 2015.