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Hydrology and Earth System Sciences Discussions

Interactive comment on "Self-potential investigations of a gravel bar in a restored river corridor" *by* N. Linde et al.

Anonymous Referee #2

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This paper reports on an application of self-potential monitoring, signal-processing (in particular wavelet analysis) and inversion for the characterisation of a gravel bar in a river. This work is rather original, in terms of combination of studied object and method (gravel bar / SP) and in terms of application of wavelet-analysis to SP time-series. I think that it deserves publication as it is of interest for the hydrogeophysical community. Nevertheless, to my mind, some results are not enough discussed/comments. For example, the explanation of the sources determined in section 3.2 should be better developed. In the discussion and modelling approach, comparison with previous works is missing. For example, concerning rainfall infiltration, the results (data and modelling) have to be compared with pioneer works published by Doussan et al. (2002, Journal of Hydrology 267), Darnet and Marquis (2004, Journal of Hydrology 285), and Allègre

et al. (2010, GJI 182). The authors should definitely refer to these papers.

I recommend that the authors take into account these remarks and the suggestions listed hereafter before acceptance.

Page 8989

Line 11 : maybe ad a reference concerning the temperature dependence of the voltage (e.g., Petiau and Dupis, 1980, Geophys. Prospect. 28).

Lines 16 and following: also applications for hydraulic characterization (e.g., Rizzo et al., 2004, JGR 109-B10; Maineult et al., 2008, JGR 113-B1; Jardani et al., 2009, Ground Water 47-2. . .)

Page 8990

Line 15: concerning multiphase flow, see also Jackson et al., 2008, JGR 113-B4; concerning experimental measurement of the coupling coefficient under partial water saturation, see Allègre et al., 2010, GJI 182.

Page 8991

Line 21: where does the hydraulic conductivity value come from? Lab or field measurements?

Line 21: The lacustrine clay layer is impermeable and acts as an aquiclude?

Page 8997

Line 1: Application of wavelet analysis to SP time-series is rare, indeed. Nevertheless this technique was applied successfully to spatial SP data (see for example Saracco et al., 2004, GRL 31-12; Gibert & Pessel, 2001, GRL 28-9)

Page 8999

Were the electrodes from SDEC? Which kind of voltmeter was used for mapping? Impedance? How long was the stabilisation time for a measurement? How was the

position of the reference chosen? How were the coefficients for the detrending determined?

Page 9000

Line 4: what about the topography? Trend? Variations?

Page 9001

Line 1: what about the cables? Where there shielded to reduce the electromagnetic noise?

Page 9004

Line 10: How can insulate boundary conditions be justified at the sides of the model for the electrical potential? Why not zero-potential at infinite distance? Same questions for the water flux. . .

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 8987, 2010.