Hydrol. Earth Syst. Sci. Discuss., 5, S1165–S1167, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S1165/2008/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Geostatistical modeling of spatial variability of water retention curves" *by* H. Saito et al.

N. Romano

nunzio.romano@unina.it

Received and published: 14 September 2008

The paper by Saito et al. deals with a key and interesting topic, which drew my attention chiefly because of my experience on the matter. I'd like to share some ideas with the authors. Firstly, I agree with T. Harter's comments about the title and some flaw at the base of the work. Basically, my comments hinge on this latter issue.

1) Actually, the basic idea of the work is not new as it fits in the general discussion and evaluation of strategies for spatial interpolation to make predictions at unsampled locations. There exist two major alternatives: (a) first-estimate (the SWR parameters, in this case) and then-interpolate, or (b) first-interpolate and then-estimate. If I am right, my option (a) is refereed to by the authors as the P-approach, whereas my option

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

(b) is refereed to as the NP-approach. Although with different aims, some authors have evaluated these strategies and concluded that option (b) seems the best solution strategy, even with some contrasting results (Wackernagel, 1994; Sinowski et al., 1997; Heuvelink and Pebesma, 1999; Leterme et al., 2007, among others). The authors should perhaps discuss a bit this question in the light of existing literature.

2) An issue I would bring up concerns the effectiveness of describing the soil hydraulic property spatial variability by using variations of the relevant hydraulic parameters of closed-form analytical expressions (BC, or VG, or Kosugi, etc.). It is my belief that statistics and spatial analyses based on the estimated hydraulic parameters only should be evaluated with great care as the relevant results might be misleading or meaningless. The hydraulic parameters (for example, the shape parameter "n"; and the scale parameter "alpha" of the VG water retention relationship), appear and act in a complex manner in a closed-form retention analytical expression, so that interpretations and subsequent calculations from individual parameters might be biased. I would prefer to deal with and manipulate the values of soil water content, which is the variable of the water retention function with a physical meaning (it may be useful to give a look at the review by Romano (2004), although written with a different aim).

3) This third comment is linked to the previous one somewhat. The water retention data points for some soil samples as depicted in Fig.3 show a physical inconsistency (namely, soil water contents increase as matric pressure heads decrease). This should not be explained only by resorting to the different laboratory techniques employed to measure the data in the drier range of the retention function. Also, the reference to the paper by Hills et al. (1993) may lead the reader to believe that reasoning was reported in that paper, but it is not (or at least I did not find any explanation in the paper by Hills et al., 1993). Apart from the fact that such an inconsistency should not be shown without a physical explanation, I am wondering what effects it can exert on the non-linear estimation of the hydraulic parameters and hence on the outcome from the two different P and NP strategies. On this aspect, it can be interesting to note that the pa-

HESSD

5, S1165–S1167, 2008

Interactive Comment

rameters of any analytical relationship describe a function in the whole plausible range of the independent variable. In the specific case of the soil water retention function we have shape and scale parameters, whose weight in describing the water retention characteristic is different for low or high matric pressure heads.

I found very useful reading the paper and hope my comments may contribute to exchange ideas on this very interesting topic.

References cited. Heuvelink, G.B.M., Pebesma, E.J., 1999. Spatial aggregation and soil process modelling. Geoderma 89:47-65. Leterme B., M. Vanclooster, A.M.A. van der Linden, A.Tiktac, M.D.A. Rounsevell, 2007. The consequences of interpolating or calculating first on the simulation of pesticide leaching at the regional scale. Geoderma 137:414-425. Romano, N. 2004. Spatial structure of PTF estimates. In "Development of Pedotransfer Functions in Soil Hydrology" (Y.A. Pachepsky and W.J. Rawls, eds.), pp. 295-319, Elsevier Science B.V. Sinowski, W., Scheinost, A.C., Auerswald, K., 1997. Regionalisation of soil water retention curves in a highly variable soilscape, II. Comparison of regionalization procedures using a pedotransfer function. Geoderma 78:145-159. Wackernagel, H. 1994. Cokriging versus kriging in regionalized multivariate data analysis. Geoderma 63:83-92.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 2491, 2008.