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Hydrology and Earth System Sciences Discussions

Interactive comment on "Extended power-law scaling of heavy-tailed random fields or processes" *by* A. Guadagnini et al.

Anonymous Referee #1

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GENERAL COMMENTS

The paper presents a scaling analysis via Extended Self-Similarity aimed at investigating the behavior of two sets of logpermeability data collected in the field at two different support scales. The data prove to be consistent with sub-Gaussian random fields subordinated to tfBm (truncated fractional Brownian motion); the parameters of the truncated power variograms and subordinators are then derived for the second data set. The paper is fully within the scope of HESS, and of interest to its readership. The analysis relies on a general scaling theory of subordinated tfBm previously developed by the authors; this is properly acknowledged and described in the technical background introducing the different kinds of subordinators. The background section

is concise and clear. The data sets are respectively analyzed in Sections 3 and 4; the first deals with 3-D data from Apache Leap Research Site with support scale of 1 m; the second with 2-D data from Escalante, Utah, with a support scale of 0.15 m. Both the practical implementation of the methodology and the results obtained constitute an important and novel contribution. The method adopted and its assumptions are clearly outlined; the conclusions are solid. The title and abstract reflect adequately the contents of the paper. The paper structure, subdivision into sections, and language are sound; the paper cannot be shortened significantly, nor requires extensive editing. The reference section is broad.

SPECIFIC COMMENTS/SUGGESTIONS

1. On p. 7390 lines 10-15 the previous analysis on the Arizona data illustrated in Riva et al. (2012) is cited. In what respect does the analysis presented here differ from the earlier one ? 2. Section 3 on Arizona data does not present results for all parameters of the tfBm (e.g. upper and lower cutoffs) as does Section 4 for Utah data. These could be of interest to the reader, in view of the relationship between domain scale and upper cutoff. 3. On p. 7393 lines 4-9 the authors comment on the vertical data at the Utah site, and present results only for horizontal transects D and H. Do the result of the scaling analysis on the omnidirectional data differ significantly from those presented ? Does this give any hint on the applicability of the analysis to 3-D data as compared to 1-D ones ? 4. In the analysis of the horizontal data at the Utah site, are the two transects analyzed jointly, i.e. M=2 and N=133-136 in (12) ?

TECHNICAL CORRECTIONS

Please check for consistency or typos the following sentences: - p. 7389 line 10 replace "are" with "is".

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 7379, 2012.