

## ***Interactive comment on “Geomorphology-based index for detecting minimal flood stages in arid alluvial streams” by E. Shamir et al.***

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Received and published: 8 January 2013

**General comments** The paper addresses an interesting topic on the relationships between water flows and geomorphic-hydraulic parameters, that were developed by classical geomorphology literature during the 60s and 70s. There are two different scientific issues to consider on this type of studies (1) Basin morphometry and stream runoff relationships (see paper by Patton 1988), based on both probabilistic and deterministic approaches; (2) Channel forming discharge is believed to be determined by events occurring at or near the bankfull discharge (Dury, 1973); and (3) effective discharge, or discharge transporting an important fraction of the total sediment load. These three ingredients have been combined on the study of low magnitude, frequent flows by the

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Shamir et al paper. I think the paper contains a good insight on how geomorphological parameters are able to describe hydrological characteristics. Moreover, the great contribution and originality of this paper is that previous studies have dealt with large floods, but none or little was done regarding small-frequent flows, which are very important in arid and semiarid hydrology. I consider that the paper deserves to be published in its present format, and only I would like to introduce some minor points for discussion and for author's consideration.

1.- Regarding basin morphometry (point 1 from the mentioned three issues above). It seems obvious that the maximum flows or peaks generated by a catchments should be related by the catchment size, but in terms of low flows the range that one should expect is more variable, since it may be generated by rainfall falling in one part of the catchment. I wonder if the relationships found by the authors were obtained by the bias in the selection of the water marks (e.g. all marks were produced by the same rainfall event during the previous rainfall season). I guess that higher water marks existed on the selected river reaches, but only the smallest ones were surveyed.

2.- Regarding bankfull discharge. I agree that many authors have concluded that frequency of bankfull flow appear to be in the range between 1 to 2 years on the bases of annual maximum flood statistics (Wolman and Leopold, 1957; Dury, 1976; Harman et al., 1999; Navratil et al., 2006). However, the authors do not mention further studies carried out in semiarid catchments that demonstrated that recurrence associated to bankfull discharge in regions with flashy hydrology is higher than those with less variable flows (Williams, 1978, Havery, 1969; Pickup and Warner, 1976), and that the recurrence may range in those cases between 1 to 6 years (Leopold 1964; Gomez, 2006). This differences on recurrence intervals for Bankfull discharge in semiarid regions should be mentioned in the paper.

3.- It is true that bankfull discharge may be several times greater than that of effective discharge (Pickup and Warner, 1976). However, the overall channel geometry is likely determined by discharges at or near bankfull, because width is constrained by the

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stability and resistance of the bank material to erosion during high flows that also scour the bed (Gomes et al., 2006). I wonder if the minor low flows are only partially modifying the work carried out by large floods and that is modifying the statistical relationships found in the paper, namely with and water depth.

Cited references Dury G.H. 1973. Magnitude-frequency analysis and channel morphology. In *Fluvial Geomorphology*, Morisawa M (ed.). Allen and Unwin: London; 91-121. Gomez, B., Coleman, S.E., Sy, V.W.K., Peacock, D.H., and Kent, M. 2006. Channel change, bankfull and effective discharges on a vertically accreting, meandering, gravel-bed river. *Earth Surface Processes and Landforms*, 32 (5), 770 – 785.

Harvey AM. 1969. Channel capacity and the adjustment of streams to hydrologic regime. *Journal of Hydrology* 8: 82- 98.

Wolman MG, Leopold LB. 1957. River Flood Plains: Some Observations on Their Formation, US Geological Survey Professional Paper 282C, 87- 109.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 12357, 2012.

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