

# ***Interactive comment on “Enhancing Flood Hazard Estimation Methods on Alluvial Fans Using an Integrated Hydraulic and Geological and Geomorphological Approach” by Zeinab Mollaei et al.***

**J. Fuller (Referee)**

jon@jefuller.com

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This paper addresses an important topic with a unique approach. It is clearly and well written. There are several gaps in the presentation that should be addressed before acceptance for publication. These include the following: 1. It was surprising to see the authors accept use of the FAN methodology as part of their recommended procedure, given their acknowledgement of its many weaknesses. The FAN methodology is outdated and based on bad science. It should no longer be used in modern assessments of flood hazards on alluvial fans. 2. The fan model does NOT predict avulsions (p.

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2, line 18). FAN merely assumes that avulsions will always occur, and predicts the probability-weighted depths and velocities of the 1% chance event, i.e., it (incorrectly) predicts the consequences of avulsions. It does not predict whether or where avulsions will occur. According to FAN, avulsions always occur. 3. The article mentions the mapping of geomorphically active (young) and inactive (old) surfaces, but there is no map provided other than the NDVI images. These images are not labelled to distinguish the old and young surfaces. The inadequacies of the FAN method become glaringly apparent when comparing maps of actual floods on fan surfaces, geomorphic surface maps, FLO2D inundation maps (all of which have similar shapes and extents) to FAN model results which stand out in shape, extent, and depth. Enhanced discussion of the surficial mapping element of the study would greatly improve the findings. 4. The article should clarify how the lateral and distal extents of the fan were determined. 5. FLO2D is a useful model for depicting flood hazards on fan surfaces, but the application should include more than a single model with only one hydrograph. The model should be manipulated to account for potential blockages, avulsions, impacts of aggradation, stream piracy, etc.

A few technical issues. 1. p. 1, line 35, the quotation from the NRC report is missing the word "than" between "laid down, [] where deposits..." Verify this on p. 62 of the NRC report. 2. "aggradation" is spelled incorrectly throughout. E.g., p. 2, line 10. 3. Figure 6 is incorrectly labelled as being FLO2D results

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