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Interactive comment on "Autogenic versus allogenic controls on the evolution of a coupled fluvial megafan/mountainous catchment system: numerical modelling and comparison with the Lannemezan megafan system (Northern Pyrenees, France)" *by* Margaux Mouchené et al.

Anonymous Referee #1

Received and published: 9 September 2016

Referee report on

"Autogenic versus allogenic controls on the evolution of a coupled fluvial megafan/mountainous catchment system: numerical modelling and comparison with the Lannemezan megafan system" by

M. Mouchené et al.

While landscape evolution models have been quite successful in realistically reproduc-

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Discussion paper

ing erosional landforms the modeling of depositional environments like alluvian fans or river deltas has shown to be hard. This difficulty can be attributed to the fact that in alluvial fans and deltas erosion and deposition closely interact with each other on the same time and length scale.

In this article Mouchené and coworkers apply the CIDRE model to study autogenic and allogenic controls and apply their simulation results to the Lannemezan megafan system in Southern France.

The paper is well written and definetly suitable for ESurf. However there are a few points, the authors should clarify before publication can be recommended.

Below my comments & suggestions for the authors:

Introduction:

As mentioned above alluvial fans are erosional/depositional environments which makes them difficult to characterize and model. The authors should emphasize this point more clearly in their introduction to distinct their work from classical landscape evolution model approaches.

Model setup:

Sentence: "We conducted a series of trial runs to adjust the relevant parameters in order to reproduce the first-order morphological traits of the northern Pyrenean foreland. In particular, the values for transport length (L), for the erodibilities of bedrock and sediments (respectively kbr and kall) and for the critical shear stress (c) need to be established."

Please clarify how the simulation results were compared to the Pyrenean foreland and describe which measures were used to determine 'similarity'. This point is also related to the following:

Results:

Sentence: "We successfully reproduced the first-order morphology of a fluvial megafan constructed on a low-elevation, stable foreland, from the erosional products of a slowly uplifting mountain-range-like block"

The authors must clarly describe what they mean by "successful reproducing the first order morphology" actually means:

1. What is the "first order morphology the authors compare their results to?s 2. Wich measure is used to determine "success"? 3. What was the initial condition which was put into the model?

See for example Topography of inland deltas, Seybold et al. GRL(2010) where the surface morphology of alluvial fans is characterized by means of simuations, lab experiments and Digital elevation model analysis and contrasted to another depositional environment specifically fluvial deltas.

Another good description of characteristics of alluvial fans can be found in: Alluvial Fans and their Natural Distinction from Rivers Based on Morphology, Hydraulic Processes, Sedimentary Processes, and Facies Assemblages, Blair et al. J. of Sedimentary Res. (1994),

p.6 L.31: What do the authors mean with "the flow is distributive" Do they mean that the system develops a diverging flow network.

Sec. 5.1 and 5.2 are rather discriptive. Do the authors have measures which characterize the formation of the fan and capture the switching of the channel network and the spatial distribution of erosion and deposition?

In sumamry the authors present a thorough description of their modeling effort but remain shallow in the quantitative interpretation of their results and a clear presentation of what they promised in the title: The constrasting of "autogenic versus allogenic controls" on the formation of depositional fans. I think the paper can make an interesting contribution if focused more clearly on the interpretation of the results using quantita-

tive measures.

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