

## Comments to Reviewer 2:

This is a useful study of the impacts of human development on two ephemeral streams in Spain. I believe this is an interesting case study, which documents many useful observations. However, there are a number of revisions that I believe are necessary before the paper is ready for final publication. A few general comments are provided immediately below, with line-specific suggestions following.

The paper has a considerable number of grammatical errors (only a few of which I have noted below), which made the paper very difficult to review. Also, in many places the language is vague and/or misleading.

*We agree with the reviewer the manuscript has many grammatical errors. We expect the overall quality of the manuscript has been improved after a qualified English grammar and style review made by an official translator. NOTE: The translator review is still underway, due to lack of time. It might be that our present answers are not yet in perfect English, but this will be corrected at the final manuscript.*

For example, in the second sentence of the abstract “Human pressure changes the fluvial environment and so enhances the effects of natural dynamics.” The authors should be more specific about which types of human pressures and which natural effects they refer to. Many human practices (engineered/structures placed in the channel, enhancement of riparian vegetation, water extraction, etc., etc.,) actually dampen fluvial response.

*We have eliminated this abstract and change to the new one:*

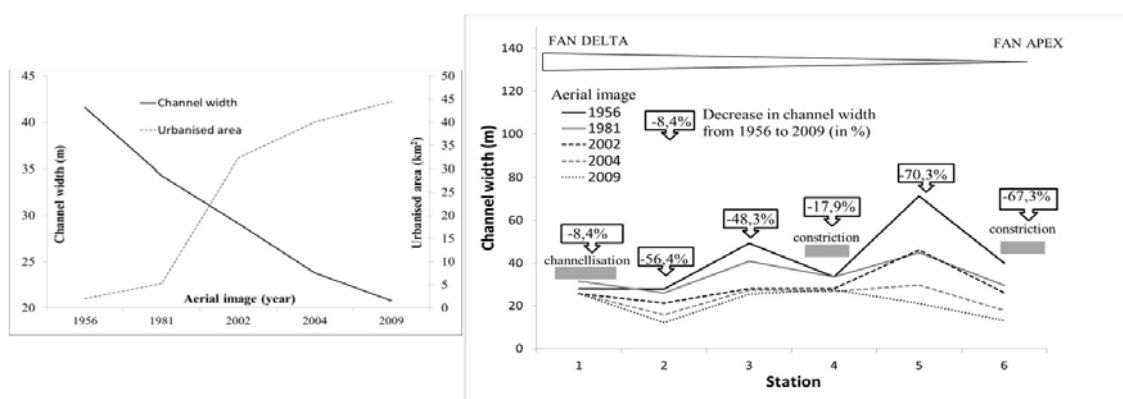
*Ephemeral streams induce flash-flood events, which cause dramatic morphological changes and impacts on population, mainly due to their intermittent and less predictable activity. Human pressure on the basin modify load and discharge relationships inducing dormant instability on the fluvial system that will manifest abruptly during flood events. Flash-flood response of two ephemeral streams affected by load supply modification due to land use changes is discussed combining both geomorphic and hydraulic approaches. During the Rivillas flash flood, intensive clearing on the basin lead to high rates of sediment flowing into an artificially straightened and inefficient channel. The stream evolved from a sinuous single channel to a shallow braiding trend occupying the entire valley floor width. Misfit and unsteady channel conditions increased velocity, stream power and sediment entrainment capacity and magnified flood damages severely. Resulting morpho-sedimentary features offered a good relationship with valley floor post-flood hydraulic model. Prior to flood- event awareness would have allowed prediction of risk sensitive areas. In the second studied Azohia stream, modelling of current pre- flood channel conditions allows us to determine channel narrowing and entrenchment in the lower alluvial fan stretch. Intensive agriculture abandonment, basin reforestation and urbanization diminish load contribution and trigger channel incision. This fact induces an increase in slope and velocity at the channel, which renews energy for erosion activating backward incision and bank undermining. The absence of water spreading dynamics on the alluvial fan in favor of single channel confinement introduces an unsteady dynamics in the system, also offering a false stability feeling meanwhile a large magnitude flood does not occur. When analyzing flood-prone areas from hydraulic models, it is important to detect*

*possible anthropic disturbance that may affect basin load budget in order to anticipate catastrophic consequences resulting from inappropriate fluvial management, before the occurrence of an extraordinary event.*

Second, the study has generated a considerable amount of quantitative information, but the text is largely qualitative and descriptive in nature. I would urge the authors to make better use of their quantitative predictions. Also, I believe the paper would benefit from a more rigorous description of the study catchments and compare/contrast of the two.

*We have introduced further explanations on text and figures in order to better support our results.*

*We also did a new figure:*



*We also improved the description of study catchments in section 2 (study area) as we show in 921, line 15 comment (see below)*

Line-specific comments:

918, Line 8: I'm unsure what the authors mean by 'harmful'. Harmful to human infrastructure? Harmful to the stream ecosystem? Channel change itself may actually be beneficial for the ecosystem.

*We use harmful related to flood risk, of course harmful could be apply for stream ecosystem. Natural channel changes may be beneficial, but human induced not generally goes to the same direction.*

*We rephrased this section of abstract as follows:*

*"These changes can be studied after the flood event, to quantify their effects and detect which cause more damage either to human or ecosystems."*

919, Line 3: There are words missing, grammatical errors in the following: "together with its sporadic character further difficult to obtain rainfall registers that helps understanding of the hydrodynamics of flash-floods."

*This sentence has been eliminated*

919, Line 6: The statement regarding anthropic impacts being greater in Mediterranean streams than anywhere else is difficult to support. In my opinion, it would be more helpful to concisely explain the anthropic impacts explicitly and leave it as 'an environment that has been profoundly modified by human activities'.

*This statement is not ours. Is given by Dedkov and Mozzeherin (1992). Our intention with this statement is only to focus how deep are the human activities.*

920: Line 29: Insert 'a' before 'name'.

*This sentence has been eliminated*

921, Line 5: While this stream may or may not have had much human 'affection' until mid-20th century, I believe the word the authors meant to use was 'influence' or 'impacts' instead of 'affection'.

*This sentence has been eliminated*

921, Line7: There are grammatical errors in: "that may originated hazards in a future flood."

*This has been done, as follows:*

*"...that may originate hazards in a future flood."*

921, Line 7: "detritical" should be "detrital"

*This has been done, as follows:*

*"...fine-grained Tertiary detrital sediments..."*

921, line 15: It would be helpful to provide more information on the climate and geomorphology of the basin. For example, average channel gradient is not a particularly useful metric. I would suggest extracting longitudinal profiles and conducting a simple slope area analysis using the stream profiler available at geomorphtools.org. Areas of threshold changes in slope are locations requiring further investigation. A rapid decrease in slope, for example, would promote deposition. I might also suggest the authors consider a rapid assessment technique such as the RiverStyles Framework develop by Gary Brierley and Kristie Fryirs. In addition, more information is needed regarding the climate. What types of rainfall events occur in this basin, convective, frontal, orographic?

*We have provided more information about the type of hydroclimatology and also some morphometric index in Rivillas basin. About the long profile gradient, we give it as general data, not in the sense of relating it with flood effects.*

*In our case, both catchments have been studied in detail in previous works (Ph.D.thesis: Ortega , 2008, and Razola, 2011, and Ortega and Garzón,2009) with field surveys and models of erosion-deposition. Although gradient changes are very important for river dynamics, for us the main point was to stress the natural dynamics introduced by recent anthropic modifications. We consider the main subject of this manuscript was not to present a detailed model of erosion or deposition conditions, as we tried to relate the main conclusions with human-induced*

*changes. As you suggest, River Styles Framework is a noticeably geomorphic approach to take in account for examining river character, behavior, condition and recovery potential. We think this should be useful in a further second step of this work as a tool for river management*

921, Line 20: What is meant by “roughly defined”? In the next sentence, are the authors referring to additional morphometric aspects that suggest a predisposition to magnification of storm events (in which case they should discuss them explicitly) or are they referring to those discussed above (which don’t seem terribly out of the ordinary).

*We rephrased the sentence in order to clarify as follows:*

*“...The geomorphology offers a gentle landscape with hills and valleys, sometimes without a well defined river channel system”*

*Also we provide more information about morphometric aspects related to flash flood character:*

*“Some morphometric aspects like high elongation ratio, low drainage density or high ruggedness number in the Rivillas watershed suggest a predisposition to magnify the effects of storms increasing peak discharge and potential flash flooding character.”*

922, Line 14: Erroneous space in “Azoh0Ä’s a”

*This has been done, as follows:*

*“...At its mouth the Azohía has developed...”*

922, Line 18: “bulted” should be “built”

*This has been done, as follows:*

*“...walls recently built around early 1980’s.”*

923, Line 10: Explain the method used for grain size analysis.

*We include a new paragraph in manuscript related to methodology of grain size analysis:*

*“...Grain sizes methodology has consisted in a first classification of samples in the field, with the help of a grain size folder; and then a laboratory analysis on 10 samples. 100 gr of each sample have been treated with various reagents for cleaning (Hydrogen peroxide (H2O2) for neutralization of organic material, 50% HCl for carbonates and oxalic acid for the dissolution of Fe). After drying in an oven, the samples have been sieved to separate conglomerates, coarse, medium and fine sands, and shales. The last step is the weighing of each fraction and the classification of the samples...”*

924, Line 16: More information is needed on inputs/assumptions used in the HEC-RAS model. What type of friction coefficient was used and how was this number obtained/estimated? How was 7 cms determined to be the bankfull discharge? If the authors determined this as a particular return interval event (e.g., 1.5 year flood) please state that instead of ‘bankfull’, lest we continue to propagate the common misconception that the two are synonymous...which

they of course, are not. If, on the other hand, the authors are referring to the actual bankfull event...the flow at which the water surface elevation is the same as the geomorphic/depositing bank, then the authors should explain how this measure was constrained.

*We rephrased this section with more information related to hydraulic model:*

*"...For both sites Hec-ras model (Hec, 1996) was used. It consist in a one-dimensional and step-backwater program which uses the Bernoulli equation to model selected discharges (1997 flood discharge in the Rivillas and different return period discharge scenarios in the Azohia Rambla) by means of surveyed channel topography. For the Rivilla's river, the valley slope was used as a contour condition, on the assumption that it was the same as the energy line slope; and a subcritical flow type was considered. Energy losses were calculated from roughness using Chow's tables (1959) for cultivated areas, which provided better results for the three studied reaches than the Cowan (1956) formula method. Contraction and expansion losses were estimated at 0.1 and 0.3 for sections with no geometrical changes and between 0.3 and 0.5 for sections with significant changes. There is no available gauging station to calibrate the final results, but flotsams were used as markers of the maximum flood level (Baker, 1977). For Azohía's modeling we assume similar inputs and assumptions, except we obtain friction coefficient from Cowan's equation due to the lack of cultivated areas. Hydraulic modeling has been shown to be useful to determine floodplain flow characteristics, distribution of flow velocities across the floodplain or to predict net floodplain deposition..."*

*We delete bankfull and replace for 1.5 year flood here and elsewhere*

924, Line 18: I do not understand what is meant by this first sentence. Please reword.

*This sentence has been removed*

925, Line 27: The air photo analyses are not mentioned in the methods. The orthorectification and georeferencing procedures should be explained as well as the digitization/mapping methods (e.g., how was the channel identified, etc.).

*We also include a paragraph in methodology related to air photo analyses:*

*"...The aerial photography analysis has been done with stereo pairs for the studied areas. We used aerial photography available on paper for different years, as well as existing digital photograph available via web ([www.cartomur.es](http://www.cartomur.es)) already orthorectified and georeferenced. The identification of the several geomorphological features (channels, bars, etc.) was performed with the aid of a stereoscope that has allowed 3D visualization of the zones..."*

926, Line 10: There are many human impacts other than dams that can affect the flood regime. Climate change can also significantly change flood regime and flow duration. A basic hydrologic analysis of flow duration curves and flood frequency is needed to demonstrate whether or not flows have changed.

*This sentence has been rephrased:*

*“...No dams have been built in either the Rivillas or the Azohia watersheds, and thus both preserve a not regulated flood regime”*

927, Line 15: How was the increase in bedload mapped/constrained? An increase in size/exposure of bars?

*Previous field analysis showed a scarcity in bedload deposition in Rivillas River, however, after the 1997 flood immediate field survey and an aerial photographic recognition denoted large bedload removal and deposition in the area. Previous river mouth at Badajoz city showed a bar absence, after the flood both channel and some floodplain areas was covered by bars.*

927, Line 22: Explain what is meant by ‘dehesa type’. This is not a common term.

*We changed oak open forest pastureland for “dehesa type”*

928, Line 15: I also refer the authors to “Dean and Schmidt, 2010 The role of feedback mechanisms in historic channel changes of the lower Rio Grande in the Big Bend region. Geomorphology” for another important paper on channel-vegetation dynamics.

*We include the reference and rephrase the sentence:*

*Much research has been done about the influence of vegetation. Riparian vegetation affects the available energy. Reaches with more riparian vegetation show less erosion than deforested reaches, as it has been described by Hooke and Mant (2000) that point out the marked differences between vegetated and non vegetated sections. Also the role of different plant types in decreasing the erosivity of flows is shown by Sandercock and Hooke(2010) and Dean and Schmidt (2010) explain the influence of non-native riparian vegetation in the exacerbation the processes of channel narrowing and vertical accretion.*

930, Line 5: “These” should be “this”. In next line, ‘are’ should be ‘is’.

*Done:*

*“...the fan is eroding at its border with the sea. This demonstrates that due to urbanisation there is not enough sediment entering the system...”*

930, Line 12: ‘Significative’ is not a word. Perhaps ‘significantly’ is the word the authors were searching for, but the sentence should be revised to make the point more clear.

*We rephrased and substitute the word:*

*“...However, this is not the case of the Azohia Rambla catchment, where comparison of aerial photos shows no signs of intensive occupation in the upper basin, only significantly in the fan.”*

931, Line 21: How was ‘anthroposized’ quantified?

*We do not quantify the degree of anthropization. We surveyed the entire basin looking for more human impacted reaches, only by means of visual estimation of infrastructures, urbanization, lack of riparian vegetation, channel realignment...percentages in text corresponds only to erosion/total flooded area*

932, Line 13: “modellized” (here and elsewhere) should be ‘modeled’

*Done. We replaced the word all around manuscript*

935, Line 2: The two previous sentences are summing up an important part of the paper. Be more specific to ensure readers have absorbed the key points from the many observations discussed in the previous few pages. For example, rather than saying ‘where the response is anomalous’...concisely state how it is anomalous.

*Both sentences have been removed. We explain the Azohía behavior as follow:*

*“...In summary, Azohia offers the reverse of the Rivillas situation, but the final reason can also be explained as an alteration in channel load supply conditions. Apparently Azohía Rambla presents little activity and absence of recent watershed variability, but the channel indicates active entrenchment on its lower stretch”.*

935, Line 11: Hooke and Mant, 2000 is a fine citation, but certainly many more appropriate citations exist for this statement, not the least of which is Lane, 1953. Another critical citation would be Francis Henderson’s Open Channel Flow, 1966.

*We include Lane (1953) and Schumm (1977) in references and cited here*

939, Line 20: The key points of the paper are summed up nicely in this last paragraph. The writing is very direct and clear. I would like to see more of this style used in other sections of the paper.

*We try to include more of these sentences along the new manuscript*

Figure 5: Possible to thicken the lines slightly or increase contrast between black lines and the background photo to allow the mapped features to be more easily studied? This figure is important and more could be done to allow the reader to connect the features discussed in the text with where they can be observed in the photos (perhaps using some unobtrusive labels?).

*This has been done:*

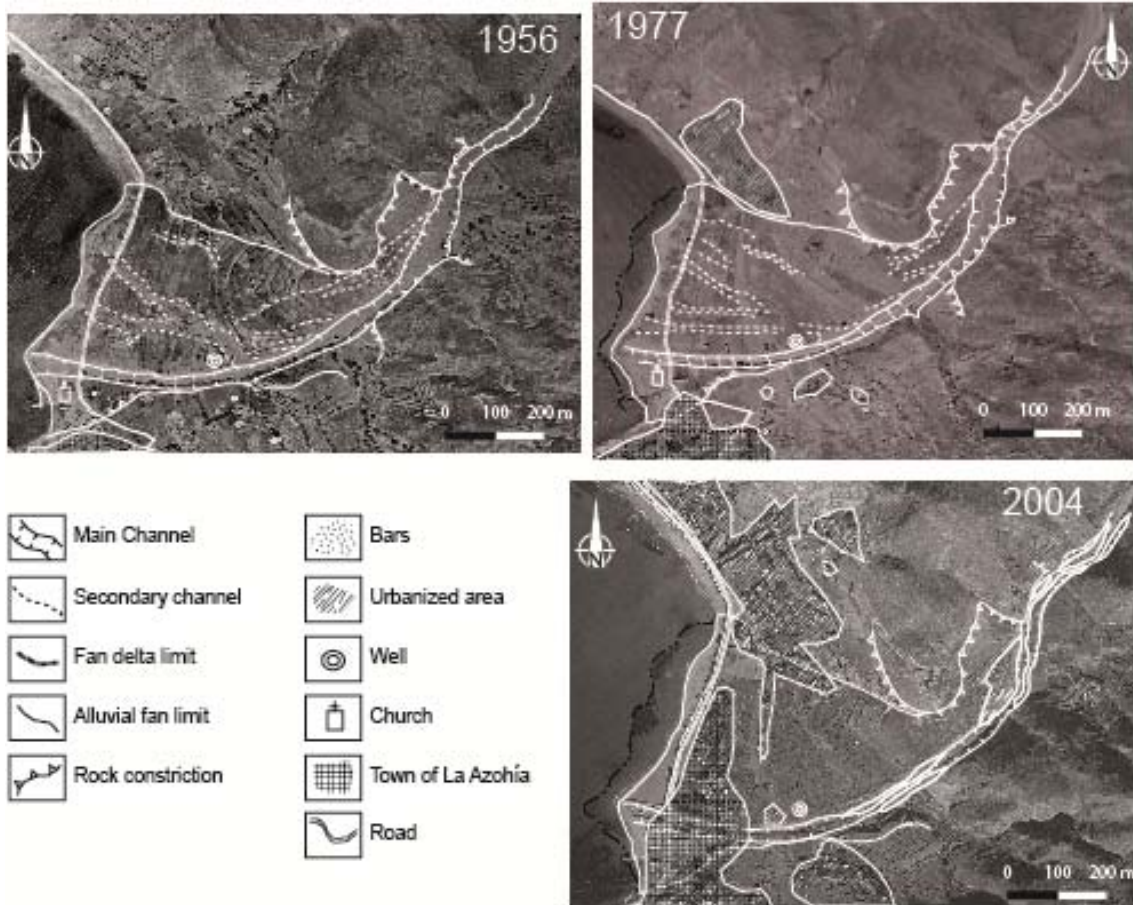


Figure 11: Font is too small in all of the legends. Perhaps use only one (larger font) legend for all three of the figures on the right and expand the size of the legends for all three figures on the left.

*This has been done*



