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Interactive comment on “Alluvial plain dynamics in the southern Amazonian foreland basin” by U. Lombardo

Anonymous Referee #2

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The article presents interesting results on small tropical rivers from the Bolivian Amazon foreland. The study is based on a 2D planform multitemporal analysis of Landsat images. The major conclusions are: a) most of the sediments are deposited in small rivers and not transferred and stored along the Mamore collector system. b) frequency of crevasses is controlled by intrabasinal processes (annual to decade time scale), c) the frequency of crevasses is not linked to ENSO activity, d) location of the crevasses is controlled by climatic or neo-tectonic events on a millennial scale, e) it has implications for conservation in a RAMSAR site, etc. Although the river descriptions are of interest, the major problem is the lack of data to justify the results because only a 2D analysis is provided. The results are relevant but they do not cover and confirm all the postulations listed above because the limited analysis on fluvial morphodynam-

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ics. The lack of field surveys, the scarcity of quantitative data on sediment transport, sediment storage, volumetric calculations, water discharge, sedimentation rates, make unsustainable to support such a large set of conclusions. As suggested by another reviewer, inferences on spatial and temporal changes in sediment load, bed elevation, stream discharges, and floodplain deposition (specifically changes in floodplain elevation) are not directly observed, but speculative and derived from indirect evidence. My suggestions is to rewrite the discussion and conclusions making focus on conceptual models for the different types of rivers but without making conclusive quantitative assumptions on sediment storage, rates of sedimentation, etc which are not sustained by the available data. It is necessary to redefine the objectives and to decrease the expectations in terms of the concrete a sustainable answer the limited 2D approach can provides on river morphodynamics. I also would suggest eliminating secondary discussions (ecology, hazards, etc) that are shallowly incorporated and that do not provide relevant information to the reader. I am listing some comments as follow. I hope they can be useful to improve this manuscript.

a) Pages 2065-2066. Introduction: the intro is a sequence of disconnected citations on ecology, geomorphology, sedimentology, basin analysis, hazards, etc. Rewrite the intro making focus on the objectives of the work and state of the art on the knowledge of the area, etc. Avoid incomplete sentences with conceptual problems, such as “through meandering, the formation of crevasse splays, avulsions and backswamp sedimentation, rivers fill sedimentary basins (Slingerland and Smith, 2004)”. Rivers fill sedimentary basins with more than just the processes listed in the paragraph. Even more, meandering rivers can (or not) fill sedimentary basins and many of the listed mechanism-process also happen in other types of rivers.

b) Pages 2065-2066. Avoid conclusions in the introduction.. ” In the SAFB, the patterns of paleo channels show that it is not the large Río Mamoré but rather its tributaries that have deposited most of the sediments that form the modern alluvial plains (Lombardo et al., 2012; Lombardo, 2014; Hanagarth, 1993).” I understand that demonstrating this

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issue is a major objective of the paper, particularly because other authors postulated different results.

c) Pages 2070-2075. The section on avulsing rivers recurrently presents conjectures on rates of sediment transport, storage etc. Avoid speculative assumptions on sediment transport because no measurements or field data support the conclusions.

d) Pages 2065 and 2076. Several conceptual problems on fluvial Geomorphology appear along the manuscript. This for example is a wrong sentence. Crevasse splays and river avulsions are the most important depositional processes in alluvial plains (Slingerland and Smith, 2004; Smith et al., 1989). Avoid this generic and incomplete sentences. You made before a different assumption when citing Singerland and Smith, 2004. All depends of the channel-floodplain style and multiple processes that can be involved.

e) Pages 2010-2079- The author emphasize the role of the tributaries in the production and storage of sediments and minimize the effect of the major collector systems. However, important references and results besides Aalto et al., 2003 are not included in the discussion. It is necessary to include the budget presented by Charriere et al, 2004; and also the results by Gautier et al., 2007 in the Beni River, which also includes some information on the Mamore River. Charriere et al suggest ca. 180,Mt of storage along 650km of the Mamore, downstream Puerto Villarroel, by meandering migrations and flood deposits. Charriere, M., Bourrel, L., Gautier, E., Pouilly, M., 2004. División geomorfológica del Rio Mamoré. In: Pouilly, M., Beck, S., Moraes, M., Ibañez, C. (Eds.), *Diversidad biológica del Rio Mamoré*. Fundación Simon I. Patiño, Santa Cruz de la Sierra, pp. 79–94 Gautier, E., Brunstein, D., Vauchel, P., Roulet, M., Fuertes, O., Guyot, J.L., Bourrel, L., 2007. Temporal relations between meander deformation, water discharge and sediment fluxes in the floodplain of the Rio Beni (Bolivian Amazonia). *Earth Surf. Process. Landf.* 32 (2), 230–248.

f) Pge 2076- “Despite a large body of 10 studies, the exact mechanisms controlling

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crevasse splays and river avulsions are not entirely understood (Hajek and Edmonds, 2014; Stouthamer and Berendsen, 2007; Ashworth et al., 2004". The sentence is unnecessary because you are not providing in this paper an analysis on the mechanisms that trigger avulsion. Concentrate in describing your data and in presenting your conceptual model for the area.

g) Page 2076- "This increased precipitation towards the Andes causes an important rise in the rivers' discharge, whilst the floodplain water table remains relatively low. Under these conditions, the formation of crevasses becomes more likely because of the higher hydraulic head (Slingerland and Smith, 1998)." Where are the field and analytical data that sustain that conclusion?

h) Page 2076- Eliminate the following sentence as you do not provide data to sustain changes in discharge, or trends in sediment transport or the description of logjams in the field, as related to decrease of sediment transport, avulsion, etc. "The behavior of these three rivers seems to be controlled by the seasonal lowering of the water table that takes place at the end of the rainy season. This causes a sharp reduction in the rivers' sediment transport capacity, increased channel infilling and likelihood of logjam formations. However, as described in the similar case of Río 5 Pilcomayo in the Chaco plains (Martín-Vide et al., 2014), it could also be the result of an increased sediment discharge due to modern landuse change in the Andes.

i) Page 2077. "This research adds new evidence to the idea that most of the modern continental sedimentary basins are filled primarily by distributive fluvial systems (Weissmann et al., 2013; Hartley et al., 2010) and shows 25 that the SAFB is an excellent natural laboratory for the study of river processes in sedimentary basins". Many systems can be radial or avulsive but they do not accomplish with the conceptual definition of "distributive systems" as postulated by Weissmann and collaborators. That happens with several of the rivers described in this paper. I would suggest checking this additional reference: Latrubesse, E. (2015) Quaternary megafans, large rivers and other avulsive fluvial systems: a potential "who is who" in the geological record. Earth

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j) Pages 2078-2079. Avoid this general sentences on hazards and ecology-conservation. If you consider that the results are relevant for environmental planning and environmental management, then, produce another specific paper to discusse those aspects.

k) Conclusions-page. It is claimed that “Most studies about alluvial plain dynamics in Amazonia have focused on large rivers, concluding that alluvial plain sediment accumulation is primarily the result of crevasse splays triggered by large, rapid-rise ENSO floods”. Be careful and change the sentence. Your conclusion is not correct because other studies are not suggesting that floods are the most important factor that trigger high accumulation rates in the floodplain. Contrarious to that, Gautier et al, 2007 and Charriere et al 2004 suggest that sedimentary storage is the consequence of meandering migration in Beni and Mamore rivers. They also make assumptions on the type of hydro-sedimentological regime that control migration rate and conclude that flood events are not the dominant process triggering high sedimentation rates- storage and cut-offs.

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