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Earth Surface Dynamics Discussions

Interactive comment on "The linkage between hillslope vegetation changes and late-Quaternary fluvial-system aggradation in the Mojave Desert revisited" *by* J. D. Pelletier

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General Comments

This is a good paper describing a logical quantitative approach to evaluating the details of a long-standing concept in the regional geomorphology and Quaternary stratigraphy of the US Desert Southwest. The author has made multiple efforts to apply quantitative rigor to many key concepts in desert geomorphology that herald from this region. I particularly like the logic and intent behind this one. This manuscript provides a significant and scientifically sound approach to addressing the issue. It should be published with minor revisions in content and presentation.

The author has done a good job demonstrating a high probability of a correspondence between diachronous elevation-dependent vegetation change and corresponding piedmont/alluvial fan aggradation. He has also provided a very nice demonstration of a regional example of a complex-response process resulting in two aggradation pulses. It is surprising that this latter fact is not touted a little more emphatically and including citation(s) to the work of Schumm and others about this important concept.

Specific Comments

Attached Document Note: I have added numerous comments in the text (call-outs on attached pdf file) and this document is only a general summary. I have avoided a lengthy write-up to compensate for delays in preparing the review.

Quality of Writing The paper is well-written. The only exception would be a mildly awkward passage explaining the section that evaluates sites from work not in the primary geographic area of interest.

Title The author could consider using the term 'elevation' in the title.

Work Cited The treatment of relevant literature is good aside from a glaring omission of citations relative to complex response models. I have a mild concern that the manuscript takes focused aim on the work of Antinao and McDonald to an extent that is possibly weakly antagonizing. In particular, interpretations and discussion of storm-type influences is not substantiated in this paper to an extent that allows much criticism of their ideas about those factors.

Modeling Details I am not in a position to adequately evaluate the details of modeling, but am familiar with the concepts as presented and believe that the approach is a logical one. I am confident that the author's modeling efforts are sound. I appreciate the notion of an elevation-dependent diachronous response of hill slope vegetation to climate change and suspect that all would agree that it must have some effect. . .possibly far more significant than previously considered (I wonder what the effect of considering

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aspect and orientation of watersheds might be). Thus, the approach to quantifying the influence of elevation and comparing against chronostratigraphic evidence is an important step that also highlights important avenues for further research and geologic mapping efforts in this region.

Monsoon vs. Tropical Storm Influence I have a general concern that the influence of monsoon-type convective storms may be being over-emphasized at the expense of tropical storms and even rare winter storms in the discussion about changing frequencies of extreme storms. Historically, dissipating tropical storms have had been shown to be significant in their extent and penetration into the Mojave and Sonoran deserts. They have also been shown to be sensitive to ENSO and affected by SSTs in the eastern Pacific and the Gulf of California. The Gulf of California, though proximate to the region is not the sole influence on the influxes of moisture into this region. Moreover, evaluations of regional systematic flood records and reports indicates that the dissipating tropical storm footprint is such that large numbers of small basins are impacted in single instances of storm incursion and that basins larger than about 1000 sq. km generally generate larger floods from this type of storm.

Historically, the incursion of tropical moisture into the region has resulted in very significant episodes of regional flooding. Some examples include: Sept. 1939, Aug. 1951, Sept. 1970, Oct. 1972, Sept (?) 1976, October 1983, and Oct. 1997. Recommend the author familiarize himself with these storms. Some were enhanced by transit up or over the Gulf of California, but others were steered in to the region from the Pacific Ocean.

These types of storms can deliver copious and intense ppt. Their dissipating remnants can spawn extremely intense convective storms under the right conditions, thus developing potential conflation with 'typical' monsoon conditions.

http://en.wikipedia.org/wiki/List_of_Arizona_hurricanes

http://en.wikipedia.org/wiki/List_of_California_hurricanes

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One can't help but wonder if periodic episodes of increasing activity of this sort could accompany a long-term transition in vegetation to generate the alluvial record described in this study. This is a topic worthy of further research and I suggest that the author acknowledge that fact and avoid committing to over-simplified statements about causative storm types.

Watershed Aspect and Elevation In my fieldwork throughout Arizona and Nevada, I have observed areas with impressively different amounts and types of modern vegetation and modern/relict colluvial deposits and soils on south vs. north facing slopes. Is the predominant aspect really not a key variable modulating the rate and extent of vegetation change over millennial time scales? Is there any evidence, say in the spatial distribution of key deposits, for this effect?

The Model Maps An aesthetic concern: The maps showing model results use a rather gloomy color scheme that is not intuitive at all to me. The lack of any kind of base map beneath further complicates my ability to interpret them. I suggest something easier to look at and understand.

Please also note the supplement to this comment:
http://www.earth-surf-dynam-discuss.net/2/C88/2014/esurfd-2-C88-2014-supplement.pdf

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