

Interactive comment on “On the potential for regolith control of fluvial terrace formation in semi-arid escarpments” by K. P. Norton et al.

Anonymous Referee #2

Received and published: 4 November 2015

This paper by Norton et al. presents a simple model that couples a soil production algorithm with a channel sediment transport algorithm to explore the impact of climatic changes on terrace production. Using a rich dataset from the Rio Pisco in Peru, where cosmogenic erosion rates and approximate soil production rates are available, they use the model to explore the relationship between climate change (here, changes in precipitation) and the timing of river aggradation and degradation driven by changing hillslope sediment flux. Interestingly, the transition to wetter conditions initially leads to channel aggradation as sediment delivery exceeds the transport capacity, but is followed by downcutting as the sediment source is progressively depleted. Hence, a single shift in climate produces a complex response of initial aggradation followed by degradation that produces fill terraces in this system. While the conditions of the Rio Pisco may be somewhat unique, this paper presents an interesting and alternate

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scenario for the relationship between climate and fill terrace creation. I enjoyed reading the paper, and anticipate that it will draw attention from researchers interested in the linkages between climate and surface processes.

Although relatively simple, the coupled model and the results are reasonable first cuts at modeling this landscape. However, I would like to see some additional information in this paper to help readers evaluate how robust this model might be. First, more detail of the Norton et al. (2014) soil production model is warranted, including the basic underlying equations and inputs. No need to go into too much detail, as the reference is cited, but some basics would be helpful, similar to what is done in the fluvial transport section. Second, there is not a substantive discussion of the limitations of the model, such as the assumptions that channel width is a simple function of drainage area, even though the channel form may, in reality, be switching between meandering, braided and bare-bedrock channel forms.

Technical corrections 719, lines 2-6: needs a reference.

Fig. 1: Add reference for precipitation, label Rio Pisco.

Fig. 2a: delineated the knickzone portion of the profile.

Fig. 3a: cannot discern between fluvial and debris flow deposits in figure. Not useful as is.

Fig. 4: Not clear what a and b refers to (photos, something in picture?). Right photo is dark, and hard to pick out the details.

Fig. 6: Explain what arrows and their size are supposed to represent. Two misspelled words in caption.

Fig. 7: It is not clear what the figures to the right of the graphs are supposed to convey to the reader.