

# ***Interactive comment on “The sensitivity of landscape evolution models to spatial and temporal rainfall resolution” by T. J. Coulthard and C. J. Skinner***

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Thank you for your comments, Declan. There are useful and are appreciated. I will attempt to address these here and in the final manuscript.

Data Source

You are entirely correct – we used the UK Composite data and will change references to this in the final manuscript.

Orography V Spatial Resolution

I will address the second part of your comment first. This is correct, this study looks at

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a reasonably small catchment, yet in comparison the 5km rain grid cells are still coarse. However, as shown in Figure 6, there was an observed relationship of higher rainfall totals in grid cells with a higher mean elevation. One of the significant advantages of increasing the spatial resolution of the rainfall input is that you get a better representation of local variations, such as orographic effects. Increasing the spatial resolution further will only improve the representation of these variations further, yet also increase the uncertainty within the rainfall product.

The purpose of the ‘jumbled’ dataset was to investigate whether the same could be observed when the spatial distribution of rainfall was changed, disrupting any possible orographic effects. In these tests the spatial resolution was kept constant, but the rainfall intensities from each grid cell reassigned to another, and the temporal resolution varied. Figure 7 showed that in spite of changing patterns of rainfall here were clear step changes in sediment yields with each temporal resolution (except between 0.25 and 1 hour), and that these sediment yields were similar to that of the non-jumbled record – this indicates that it is the spatial resolution of the rainfall input which is influencing the sediment yield, and not a specific distribution of that rainfall. With this point, you are probably correct in that a pseudo-orography will exist, with some pixels still receiving a higher rate of rainfall than others, just not related to the elevation. The concluding remarks of the first paragraph of Page 10 should therefore be edited to say “Therefore, this strongly indicates that it is the spatial and temporal resolution and not any specific distributions of the data that are responsible for increased sediment yields previously described.” Further similar edits will be made to this section accordingly.

## Unlimited Sediment Supply

Yes, this experiment did assume an unlimited sediment supply. This is appropriate within the aims and objectives of the tests. This study is meant as an experiment looking at the sensitive of the model to the spatiotemporal resolution of the rainfall input, and data from the Swale were used to run this test as they had been used in the past by the authors and were well understood. However, it is not meant to be a case

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study of the Swale basin or an attempt to accurately predict sediment yields from the catchment. This reflected in various aspects of the experiments, not just limited to a lack of bedrock representation, but also the lack of vegetation or land use variations too. All could act to either dampen or magnify the sensitivities observed here, and would make ideal foci for future studies (some already are). However, this could be stated more clearly throughout the manuscript and will be in the next iteration.

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