

# ***Interactive comment on “Spatio-temporal patterns of the effects of precipitation variability and land use/cover changes on long-term changes in sediment yield in the Loess Plateau, China” by Guangyao Gao et al.***

## **Anonymous Referee #2**

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The author’s attempt to determine the drivers of changes in sediment yield within the Coarse Sandy Hill Catchments region of the Loess Plateau. The authors attribute changes in sediment yield to both land-use change and changes in precipitation. Although the authors do a great job characterizing changes in precipitation, land cover, and sediment yield, their statistical analysis leaves much room for improvement and many of their figures could be clarified.

While land-use change (specifically crop to forest) and precipitation change are certainly major drivers in changes in sediment yield, soil properties, topography, and

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changes in urban cover must also play some role, and thus warrant some discussion as to their exclusions, or what excluding them might mean for the paper's results. Moreover, as the author's bring up, the intensity of certain storms are not always captured when one looks at annual average precipitation, but these intense storm greatly affect sediment yield. Thus, analyzing the number of intense events along with average precipitation may prove insightful.

Lines 35-36. The effect of precipitation is also temporally variable, yet it is framed in the abstract and throughout most of the paper as only being spatially variable.

Lines 144-145. Although the author's provided a robust motivation for their analysis of the their 14 chosen catchments within the CSHC, a sentence or two explaining why they are studying the CSHC would be useful.

Line 179. Why resample the AVHRR data?

Lines 179-185. What is meant by vegetation cover? Do the authors estimate vegetation cover using NDVI or a different vegetative index?

Lines 183-185. It seems as though the authors have useful spatial information regarding the total areas impacted by conservation measures (the Yao et al. 2011) dataset, yet it's unclear where this comes into play in their analysis.

Lines 192-194. Did you test your variables after performing the TFPW to see if any residual autocorrelation remained?

Lines 220-226. What was the land-cover during the study period which the authors consider their reference period where "the effects of human activities were slight and could be mostly ignored." Here and throughout, presenting the spatial data as maps rather than bar graphs or scatter plots will more clearly to the audience. Especially given in the results and discussion where the authors often reference the differences in spatial patterns.

Line 254. As mentioned above, need to be clear about the proxy used for vegetation

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cover.

Line 260, 263. Average annual LAI?

Line 278-288. Why use the coefficient of variation and not standard deviation? What do these results tell us?

Section 3.3. In Equation 6, precipitation is also a temporally variable component, and 'area treated with erosion control measures' is also a spatially variable component. And it seems as though other factors (steeper slopes, soil properties, impermeable surface area, etc) may also play a role in affecting SSY. Moreover, it seems likely that changes in precipitation and land-use change may interact to affect sediment yield. The authors may want to rethink the way they've framed their analysis. Especially as 6/14 catchments in their analysis exhibited no significant correlation. A multiple regression analysis with an interaction term may be a more appropriate means of analysis.

Lines 387 and throughout: Authors often discuss a 'clear spatial pattern' present in their results, thus maps would be more useful as figures than scatter plots.

Line 393 and 419. Remove undoubtedly.

Lines 449-454. Not quite sure how this resulting empirical relationship follows from the preceding analysis. What are  $k_0$  and  $k_1$ . Also, once better explained, the authors could prove this empirical relationship is robust by showing how accurately it predicts SSY when they input observational data.

Table 2: Add an ID column.

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