Anonymous Referee #1

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The authors collected and analyzed hydrologic data to develop the relationships between sediment concentration and discharge, vegetation index and discharge and sediment concentration in the Yellow River Basin using Wavelet Coherence method. Eventually they drew some conclusions on these relationships. Both data and analysis well support these conclusions. The reviewer recommends to accept the paper with some minor revisions as follows,

We appreciate the reviewer's insightful inputs that have helped to improve the quality of this manuscript. In response to the comments, we have made corresponding revisions. Our response to each comment is listed below in blue with the changes in manuscript, we also include the specific line numbers of the changes we have made. We hope the reviewer find the revision and responses sufficient.

1. Double check the whole manuscript and correct some typos such as: Line 108 ("")" is expected in Eqn 1), Line 121, "the" strongest. . . etc.

We have corrected the typos as following, thank you (please see lines 116 and 133).

L116: $R^2(s) = \frac{|S\left(s^{-1}W^{XY}(s)\right)|^2}{S\left(s^{-1}|W^X(s)|^2\right)*S(s^{-1}|W^Y(s)|^2)}$

L133: "This analysis is applied only at annual scale since this is when the coupling from wavelet coherence analysis is the strongest."

2. Lines 118 – 129, use formula instead of description to explain the physical meaning of these parameters.

We have now replaced the description of the parameters by equations as following, thank you (please see lines 126 – 144).

The annual discharge (Q_a) and the sediment yield (L_a) were aggregated from daily to further examine their correlation:

$$Q_a = (\sum_{i=1}^{n}(Q_i * 3600 * 24))/Ad * 1000 \quad (2)$$
$$L_a = (\sum_{i=1}^{n}(Q_i * C_i * 3600 * 24)) \quad (3)$$

where Q_i (m^3/s) and C_i (kg/m^3) are the daily discharge and sediment concentration, Ad is the drainage area (km^2) of each gauge, n is the number of days in each year. This analysis is applied only at annual scale since this is when the coupling from wavelet coherence analysis is the strongest. The annual mean concentration (C_a) was calculated as:

$$C_a = L_a/(Q_a * Ad/1000) \quad (4)$$

The long-term mean annual discharge (Q_m) and the long-term mean annual concentration (C_m) was also calculated by averaging for the period of 1951 to 1986. Note that both the parameters Q_a and Q_m used here are area-specific discharges (mm/yr). For each gauge, a linear regression was fit to describe the correlation between annual discharge (Q_a) and annual mean concentration (C_a). The slope of this linear regression (α_{QC}) is used to describe the rate of change in sediment concentration with changing discharge at annual scale.

3. Even though NVDI has been described in the cited literature, it will be more convenient for readers understand the effect of vegetation if the authors can briefly explain the definition.

We have added following brief explanation on NDVI in the manuscript, we hope the reviewer find this satisfactory (please see lines 90 – 95).

The vegetation data used in this study corresponds to the normalized difference vegetation index (NDVI), which is an index calculated from remote sensing measurements to indicate the density of plant growth (Running et al., 2004). The NDVI data was downloaded from NASA's Land Long Term Data Record (LTDR) project, which provides daily NDVI observations globally at a spatial resolution of 0.05°.

4. More discussion on the determination of threshold value of discharge is expected.

We obtained the threshold value of discharge by the slope in the Q-C regression (α_{QC}), 60mm/yr is where most α_{QC} is less than 0.1 while 100mm/yr is where most α_{QC} is less than 0.01. Those gauges with larger mean annual discharge are the ones downstream of the major tributaries or along the main stem of YR. For these gauges, due to the larger drainage area, there is significant heterogeneity in the catchments. The region generates more discharge doesn't necessary contribute most in sediment yield (Figure S4), factors other than discharge may play important roles. This threshold discharge was also found in arid watersheds in Arizona though with quite different numbers. This divergence could be attributed to the different catchment characteristics like soil type, topography and so on. It would be interesting to further study the cause of the threshold discharge at these specific values, but this is above the scope of this work and we will pursue this in our follow-up studies. We have now added the following discussion in the manuscript. Hopefully the reviewer finds it sufficient (please see lines 166 – 172 and 346 - 348).

L166: For example, gauges with α_{QC} less than 0.1 are the ones with Q_m larger than 60mm/yr. When Q_m is larger than 100mm/yr, the variation in sediment concentration is less than 1% of that in streamflow ($\alpha_{QC} < 0.01$), and thus sediment concentration can be approximated as invariant to changing discharge. Most of these gauges locate on the main stem or near the outlets of tributaries. This increased independence between sediment concentration and discharge may be attributed to the heterogeneity in these relatively large catchments.

L346: Analysis with more field measurements could also help explain the threshold discharge of the emergent stationarity.

5. How will vegetation type, climate, and other watershed characteristics affect the conclusion? A short discussion will be helpful.

The vegetation types in the YRB include bare soil, grassland, shrubs and forest (Zhang et al., 2016), our conclusion is derived from these various vegetation types. But we only look at the NDVI in this study, it is possible that the capability to prevent soil erosion may vary with vegetation species despite of similar NDVI values. This worth exploring with more detailed studies in the future. On the other hand, the climate in the YRB is semi-arid and arid (mean annual precipitation varies within the range of 100mm to 800mm), it would be interesting to see whether our conclusion would sustain under humid climate. Although catchments with humid climate usually have well-developed vegetation coverage, thus the soil erosion issue is less severe, there could still be soil erosion problems. Thus, it would be interesting to study the soil erosion issue in those humid catchments. We have included the following discussion on this in the manuscript, we hope the reviewer will be satisfied with it (please see lines 342 – 346).

It will be helpful if we could examine our findings in other watersheds worldwide with different climate and vegetation types. Although humid regions are usually considered as well-vegetated, study shows that there could still be erosion issues in these areas due to topographic gradient, precipitation intensity, and soil properties, etc. (Holz et al., 2015).