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Hydrology and Earth System Sciences Discussions

Interactive comment on "Runoff and sediment load of the Yan River, China: changes over the last 60 yr" *by* F. Wang et al.

Anonymous Referee #2

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The manuscript analyses climate data (temperature and precipitation) and run-off, sediments load and sediment concentration in the catchment area of the Yan river in China. The data cover the last decades and the focus of the analysis is to disentangle the climatic ad anthropogenic influence on the changes of sediment load over this period. The authors reach the tentative conclusion that the anthropogenic influence can b, at least partly, responsible for the observed reduction in sediment loads. They suggest that the mechanisms for this influence involve the growth of forested areas and the constructions of dams.

In my opinion the text is acceptably written, and the reader can understand the analysis and the chain of reasoning. I have, however, some concerns about the statistical

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analysis. I think that some of the conclusions are not completely supported by the results. Also, the rationale for using the mass curves to present the time evolution of all variables is not clear, and the time series themselves would provide a more clear picture of this evolution. Actually, the text has to interpret for the reader the shape of the mass curves in terms of the actual data.

1. In several instances in the manuscript, the result of the statistical analysis are indicated without units (For instance, '(t, tmax and tmin , respectively) all increased significantly during the research pe0 The changing rates of t, tmax and tmin were 0.038, 0.019 and 0.046, respectively') . Though this would be normally interpreted as an oversight, the authors do compare the magnitude of the long term trends in the different variables, although they are not directly comparable. For instance, in the conclusions they state 'The annual runoff, sediment concentration and sediment load all have significant trends of linear decline in the last 60 yr (Fig. 2). The runoff decreases faster, with a rate of slope of 1.32, than sediment load (0.71), and therefore the decreasing rate of sediment concentration (induced from ratio of sediment load to runoff) was very big (2.34).' The sentence is really meaning less because the regression slope for run-off has completely different units than the trend in sediment load. If run-off had been measured in G m3 instead of M m3, the trend would have been numerically much smaller. This indicates, in my opinion, that the authors have applied the statistical analysis as a sort of black box method, and did not take much care in its interpretation.

2. My second major concern is the use of mass curves to display the data. The mass curve are approximately a sort of accumulated deviations (from the long-term mean) over time. But when the authors refer to the mass curve, they translate them for the reader in terms of actual deviations from the long-term mean, without really using the mass cruves themselves. One example can be found here '10 Over the whole study period, the mass curves of t, tmax and tmin showed similar changes by declining first and then rising; the changing points of t and tmin were at 1988 and tmax in 1996. This indicates that mean annual t and tmin before 1988 were smaller than the mean for the

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whole period, but that after 1988 they were higher than the mean of whole process.' Why do not describe the data in terms of the observed deviations directly ? The stages defined by the mass curves can be much more easily identified in the deviations from the mean directly, than in in the accumulated deviations. The mass curves represent an integration of the process, but then the authors had to resort to discuss the time derivative of the mass curves, i.e. the original series.

3. To better identify the anthropogenic influence, the authors define paired years in which precipitation and temperature were similar, but that displays different values of the sediment transport. The definition of similar years is also weird : years with values of precipitation and temperature with less that 1% difference. For precipitation this would make sense, but not for temperature, because the 1% threshold depends on the units of temperature that one is using, and these units are arbitrary. A researcher using degrees Fahrenheit or Kelvin would find different similar years. Actually, using Kelvin, most years would fall within the 1% threshold. Of course, the results of the analysis cannot depend on an arbitrary choice of units. A more proper way to define similarly in this context would be to choose years than deviate less than a certain threshold of the long-term standard deviation. This definition is units-independent.

4. The final conclusion, namely that anthropogenic factors must play a role because methodologically similar years display different sediment transports, may be correct, but I found it very weakly substantiated. As the authors wrote, a mean value of temperature and in particular of precipitation, may hide huge difference in the distribution of daily or weekly values, which may strongly influence run-off and sediment load, at least in theory. Flash floods caused by heavy rain during a few days is a clear example. Thus, there can be many more meteorological factors than can explain these differences without necessarily invoking the anthropogenic contribution . Probably, the causes put forward by the authors contain a portion of truth, and they sound reasonable. But the analysis should go deeper to really pin-point those factors.

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