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Hydrology and Earth System Sciences Discussions

Interactive comment on "Sedimentation in the Three Gorges Dam and its impact on the sediment flux from the Changjiang (Yangtze River), China" *by* B. Q. Hu et al.

Anonymous Referee #3

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The work appears to be an addition to the previous studies of the second author and S. L. Yang (as cited by the current paper). The scientific contribution of the current work lies in applying Brune's method to predict the theoretical trapping efficiency (TE) of four dams to be constructed (finished) in the upper stream of the Three Gorges Dam (TGD). Based on predicted TE, reduction in sediment discharge to Yichang station is calculated. Via a linear regression relationship between sediment load measurement at Yichang station and that of downstream Datong station, reduction in sediment load at Datong station is estimated. Based on this estimation, along with several other factors, decline in the sediment flux from Changjiang to the (East China) sea in the future

is projected. Another contribution is the estimation and discussion on the sediment deposition caused by the TGD, though some associated augments are similar from those available from the literature.

As a researcher who took part in the TGD project and is paying close attention to the advanced research on the TGD, I agree with two other referees on that this is a fairly well written paper with a topic of great interest for HESS readership. I also agree with them on that further work is required to elaborate the paper title, organization, presentation on results and discussion, etc. However, I have a few additional comments which hopefully might be helpful for further improvement of the paper.

First of all, the authors construct a linear regression for the post-TGD period based on data from a mere five-year period (2003-2007), which may not provide sufficient information to establish a robust relationship. It would add more insights if the authors could thoroughly discuss the validity and limitations of this approach. In addition, extreme values (outliers) usually dominate the formulation of the relationship. I noticed that the authors excluded extreme floods in 1954 and 1998 in Fig. 4b (p. 5204). In Fig. 2 (p. 5202), however, the extreme value (the cycle in the upper right corner of the figure; I guess it is from year 1998) was not excluded. I am wondering whether the corresponding linear equation presented in Fig. 2 would change significantly when this extreme value is taken out of the calculation. Furthermore, it is clear from Fig. 4b that the linear relationship for the period 1953-1968 is weak. Brief discussions on this point might help to convince the reader on why linear relationship is eventually applied between two stations for predicting purpose.

Second, according to the authors, "...sediment reduction from the Changjiang to the sea happened even earlier before the TGD..." (p. 5188) and the reduction could be attributed to "the increased reforestation in the lower Jinshajiang basin..." (p. 5188). While reforestation in upper stream might be a sound argument, there is another fact which likely contributes to the reduction even though it is normally ignored in scientific studies. The fact is that, at the dam location, the main stream (about 900 m in width) of

Changjiang was intercepted (by cofferdams) in late 1997 and the water was discharged through a man-made open channel (about 350m in width) beside the main stream until late 2002 when the open channel was intercepted as well. Considering the geographic location of the cofferdam (located in the turning point of a rough C-shape stream channel), it is possible that the cofferdam could trap part of the sediment within the period from late 1997 to late 2002. The trapping effect is evident from Fig. 4 (p. 5204) that the sediment load observed at Yichang station (downstream of the TGD) gradually decreased in four consecutive years 1999-2002 (extreme flood year 1998 excluded) after the main stream was intercepted.

Third, two days ago (September 15, 2009), the TGD starts storing water with the goal of elevating the current water level (around 156 m) to the designed normal water level of the reservoir (175 m) in this coming October or November (depending on the amount of incoming water from the upstream). It is highly likely that the approximate 19 m rise in water level would lead to landslides and debris flows at various spatial scales. Both landslides and debris flows yield sediment to the reservoir, contributing to increase in sediment flux at the TGD. It might be helpful to address this point in the discussion to make the study more inclusive. However, I would leave the decision to the authors.

Last, there are a couple of minor issues need to be clarified. The authors state that the TGD is "with 181 m in height" (p. 5182). To my knowledge, the height of the dam is 185 m instead. In addition, the authors use "Changjiang Water Conservancy Committee (CWCC)" (p. 5182 and p. 5190) in the text. I am wondering whether it is referring to the "Changjiang Water Resources Commission (CWRC)" or not.

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