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HESSD

8, C5313–C5317, 2011

Interactive Comment

Interactive comment on "Suspended sediment fluxes in an Indonesian river draining a rainforested basin subject to land cover change" *by* F. A. Buschman et al.

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We thank reviewer #2 for the constructive comments. As the reviewer points out, future studies can benefit from our paper. Since a large team of researchers has selected the Berau region as their study site, many studies may benefit from this study in the near future. Although the time-series of sediment load are short compared to datasets in well-gauged catchments, they constitute the first dataset ever obtained in this area, and can be the basis of the development of new techniques which aim to cope with data scarcety. Our paper offers an estimate of the annual sediment load in the tidally affected part of the river. Since the cross-section under study is near the coast, the predictions of sediment load to the coastal ocean may be better than in many other studies where sediment load is observed in the unidirectional flow part of the river, located further upstream. The tides generate variations in the daily averaged suspended sediment concentration, which create scatter in the sediment rating curve (upper panel of Figure R1). Suspended sediment concentrations can substantially higher during spring tide than during neap tide, while the river discharge remains unchanged. We will exclude this figure in the HESS paper, since it may be considered obvious that in a tidal river these relations are nonlinear.

Specific comments

1. In the revised ms, we will better describe the objectives of the study, which is part of a large cluster of projects focusing on land-ocean exchanges in the Berau coastal zone. In the present contribution, the main objective is to obtain an estimate of the annual sediment load. To investigate how representative the obtained estimate, the sensitivity of the sediment load to river discharge and tides was analyzed. A secondary objective is to predict, at first order, how the suspended sediment load may respond to projected land use/land cover changes.

2. A title that covers the present work more closely reads: “Suspended sediment load in the tidal zone of an Indonesian river”, which is the prospected title of the revised ms. We take the view that the available data of the catchment, including the results of the USDA NSCS, are too limited to allow for a sensible application of a distributed erosion model. Supposed it would be possible to estimate all parameters needed, the available validation dataset is too limited to rigorously establish whether or not the distributed model outperforms the lumped model. Our experience is that data quality and data availability both have to be high for a distributed model to outperform a lumped model. Our efforts to quantify the land to ocean transfer of sediment in a data poor environment can be considered to be part of the IAHS initiative ‘Predictions in ungauged basins’, which aims to reduce uncertainty in hydrological predictions. Pioneering studies like

ours are set out to obtain benchmark information in poorly gauged regions, which can be the basis of the development of new techniques that serve to cope with data scarcity at a later stage. One cannot expect an all-encompassing model of the region to be realized from scratch.

3. A more detailed justification of the selection of the monitoring sites will be given. We decided to deploy the instruments in the Berau tidal river, since in this 30 km stretch all water and sediment is concentrated in a single channel. The cross-section at Gunung Tabur is within this 30 km stretch, and this was the only location where a solid jetty was available to mount the instruments to for a longer time. The OBS of the OMS was installed at about 1.5 m above the bed, which was between 25% and 50% of the total depth, depending on the tidal stage.

4. The method applied to the data of September 2007 can be termed a turbidity index method, which results in better estimates of the cross-sectionally averaged suspended sediment concentration (SSC) than the ones obtained by simply assuming the SSC to be uniform over the entire cross-section. During May and June 2007, this uniformity assumption did hold, which we will mention this in the revised ms.

5. We chose not to present the SSC in the cross-section for intermediate tidal ranges, since the only purpose of a figure conveying this information would be to show that the spatial variation is limited. Figure 5 already shows that the spatial variation of SSC for the lowest and highest tidal ranges is limited. Since it is unlikely that high spatial variation occurs for a tidal range in between these two extremes, we do not further emphasize these SSC contours. In the revised ms we will mention that the spatial variation of SSC for the observations under conditions of intermediate tides is smaller than during spring tide.

6. The reviewer suggests to measure the size distribution of suspended sediment in the river. We did obtain the size distribution of bed sediment, but we have no detailed information about the size distribution of the suspended sediment. The grain size dis-

tributions of the river bed samples were highly variable, featuring peaks at the clay and silt fractions, as well as at the medium sand fraction. The majority of the bed sediment is fine sand.

7. Regarding Figure 5, we chose to use the real depth, such that the plots are easier to interpret, although the derivations were carried out using sigma-coordinates. In the revised ms we will follow reviewer's suggestion. Also, we will use ebb, slack and full flood to indicate the three different phases in a tidal cycle for neap tide.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 7137, 2011.

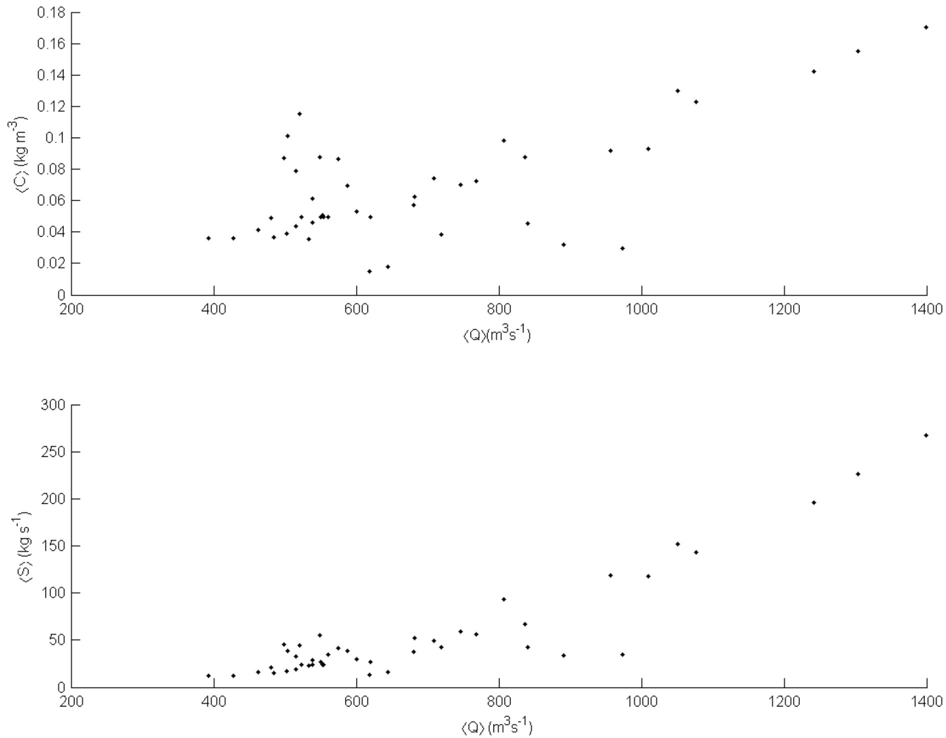

Fig. 1. Suspended sediment rating curve (upper panel) and suspended sediment load versus tidally averaged discharge.

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Interactive Discussion

Discussion Paper