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Hydrology and Earth System Sciences Discussions

Interactive comment on "Variation in turbidity with precipitation and flow in a regulated river system – River Göta Älv, SW Sweden" *by* G. Göransson et al.

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Overview

This manuscript describes a well-executed study that examines the relations between turbidity (Tu) in a river system and expected drivers such as precipitation (P), water-level (WL) and discharge (Q). The work is undertaken along the length of a river in Sweden downstream of a large lake. In many respects, this lake confounds much of the interpretation, however many rivers are located below lakes and/or are heavily regulated. Thus, the study does shed some light on the importance of looking at Q-Tu and Q-SSC relations in such rivers and of identifying relevant factors that influence

these relations. As such the results presented are important and provide some new insight. I agree with the comments raised by referee 1 so will not repeat these. The manuscript does require some editing for English, although this is generally very good and the manuscript is clearly structured and presented.

Main comments

My main concern is really one of explanation. It is well-known that, for a given river reach/site, turbidity varies according to numerous factors including the physical and mineralogical composition of the sediment. Thus changes in sediment particle size composition, mineralogy and organic matter content (due to say changes in sediment sources) are likely to influence the turbidity signal at a given monitoring station, regardless of changes in flow conditions. The authors may wish to address this if they have available data, or at the very least discuss that this is a possible cause of the observed variation in the Tu signal. On page 264 the authors allude to data on particle size and organic matter content. The latter varies from 2% to 20%; which is a fairly large range. Also, provide the number of samples analysed.

The authors correctly identify many of the main issues associated with suspended sediment in rivers. They also discuss the importance of turbidity as an important parameter, which has some environmental significance. I feel that the authors may in fact be downplaying the importance of turbidity as a key fluvial parameter that is often of more use than suspended sediment concentration (SSC) for water regulators and those concerned with effects on sewage treatment works and other engineering structures (i.e. for such people the measurement and use of Tu is often preferred over SSC).

Many workers have documented hysteresis between SSC/Tu and Q. Such patterns are often useful for identifying key processes (i.e. sediment supply, sediment sources, sediment exhaustion). While it may be difficult to do such an analysis with daily-averaged observations (i.e. ideally shorter time interval data would be required), some comments

on hysteresis are needed.

Specific comments

Please provide information on the approximate travel time of water between the outflow of the lake and the downstream-most sampling point (i.e. the river reach studied).

Page 261 - I would like to see more information on how the timeseries were created, especially of Tu. Were minute-averaged data based on shorter time-scale measurements (every 15 seconds) then averaged over 1 minute? Or were measurements made every minute and averaged to get a daily average value?

Page 262 – The river flow at Gotz Alv downstream of the bifurcation was determined as the difference in flow from the Litta Edet and Nordre Alv monitoring sites. There are some important tributaries between these two stations, were they accounted for? Or what is their influence likely to be?

Page 263 – I am slightly unclear about the comment that extreme values and outliers of Tu were included in the dataset. Please explain the rationale and implications of this.

In the discussion section (page 272, line 21 onwards), the authors mention the importance of sediment derived from the lake and the relatively low sediment inputs from the erosion of the channel bed. To some extent, this contradicts the information in Figure 2 and some of the later discussion (e.g. page 273), which identify the erosion of the channel bed as important/significant.

The floodplain is discussed as a potential source of sediment (page 274, line 12). It can often be an important sink of sediment during overbank flows. Please consider and discuss if the floodplain also acts as a sink, and what the implications of this may be.

Tables – in the captions please make it clear what T, P, WL and T are.

Figure 1 – add a scale and delete “shown”

Figure 2 – this shows that (fine?) sediment fluxes in this reach are dominated by transfers and inputs from channel bed and channel bank erosion and tributary streams. There does not appear to be any net deposition on the channel bed or floodplains, or indeed any other storage elements. Is this correct?

Figure 9 – please give flow and P classes in the caption (i.e. a reader should be able to interpret the tables and figures without referring back to the manuscript text)

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 255, 2013.