Earth Surface
Dynamics
Discussions

Open Access

Interactive comment on "The mass distribution of coarse particulate organic matter exported from an alpine headwater stream" *by* J. M. Turowski et al.

Anonymous Referee #2

Received and published: 2 July 2013

1   General Comments

The present study examines the mass distribution of coarse particulate organic matter (CPOM, a term that covers all sizes of organic particulate matter as opposed to large woody debris, LWD) in the well-researched Erlenbach torrent. The power law scaling across several orders of magnitude is compared with available data and argued to be useful for several purposes, among others for the estimation of LWD mass from smaller fractions (relevant for natural hazards assessment, ecological and geomorphological properties), or for the estimation of fine CPOM from LWD or other comparatively coarse fraction (relevant for ecological properties as organic matter is a major source of energy

for in-stream biota). Moreover, according to the findings, the observed clear discharge-CPOM transport rate relationship can be employed to estimate CPOM budgets and the probability of especially LWD particles of given size.

In my opinion, the paper is very well written and well structured, the methods are described comprehensively with only few exceptions, and the results appear to be justifying the conclusions that are drawn by the authors with due caution (and backed, as well as possible, by data derived from the literature). As outlined in the study area sections, the authors draw upon high-quality runoff and sediment data sets and long-term research experience in the studied catchment. The topic is of high relevance for several disciplines, and it is expected that the paper will stimulate more research on the basis of the interesting findings. I consider the paper ready for publication after only minor revisions, most of them concerning the methods and results section where I'd like to see some amendments that clarify details (see specific comments); some of these details could affect the quality of the results.

2   Specific Comments

- p5l21: Please explain more precisely how the flow depth is used for extrapolation. I guess that different sizes of CPOM are transported in different manners, e.g. like bedload for larger particles, and like suspended load for the finer fractions. In this case, simply multiplying the cross sectional area of the trap with a factor to get the CPOM load for the cross sectional area of the stream would work for fines transported in suspension, but not necessarily for CPOM transported in a bedload-like manner.

- p6l17: Assuming that the volume of sediment (and CPOM) caught in a retention basin can quite large (also compared to log jams), probably in the order of tens of cubic meters or even more, how do you sample, and how do you estimate the

total CPOM volume ? Or is there a full sample of total CPOM volume ?

- p6l22: While, for example, the minimal particle mass threshold is chosen (and well justified) on the basis of the empirical data (p8l7 ff), the choice of the 5000 l/s threshold for the initiation of LWD appears to be quite arbitrary, it should be backed by some theoretical or empirical justification.

- chapter 4: The authors report a power law scaling of the relative fraction of given CPOM particlee masses, and a power law dependence of CPOM transport rate on discharge. The fitting of a linear function to log-transformed data to obtain a power law is common practice; however, mathematicians tell us that this leads to biased results, especially where we want to deduce a power-law behaviour. For the findings of this paper, I don't think that it is absolutely necessary to change the described procedure, but I'd like to refer the authors to another, mathematically probably more rigourous approach to powerlaw fitting (there is also an R procedure published by CR Shalizi that e.g. automatically detects the threshold above which the power law holds) published here: Clauset A, Shalizi CR, Newman MEJ. 2009. Power-law distributions and empirical data. SIAM Review 51: 661–03.

- p7l16: Please give sample size n

- p8l21: Are the extreme events excluded from the regression fitting as a matter of principle ? They do not seem to contradict the remaining results, and they do not seem to influence the regression coefficients too much (low leverage). Anyway, the correct prediction of events of that size by the regression is highly desirable.

- p11l3: For longer time scales, this should be termed an estimation rather than a calculation, and the underlying assumption of such a temporal extrapolation should be discussed (for example, steady state conditions (rate of CPOM input depending on type of forest, its temporal persistence and regrowth, rate of decay,

etc..., see section 5.4 where this is discussed thoroughly for the transfer ("extrapolation") of results to other catchments)

- p11l4ff: "CPOM transport is dominated by large discharge events" - yes... but the August 2010 event is considered to happen once in 50 years, on average (p5l2). The question on which type (magnitude) of event dominates i.e. contributes the lion's share to the sediment transport, for example, is a classical question in geomorphology (Wolman and Miller, 1960)

- p12l20: with "connectivity", you probably mean hydrological or runoff connectivity as CPOM is supposed to be transferred to the stream by overland flow

3   Technical Corrections

- p2l24: either "leaf and wood fragments" or "leaves and wood fragments"

- p7l21: "borne"

- p9l11f: suggestion: "(the two extraordinary low values were derived from small sample sizes at the Brueggenwaldbach and the Grossbach and are therefore considered unreliable)"

- p15l2ff: "High quality data on piece mass of transported CPOM spanning the full range of masses are rare"