

Interactive comment on “Influence of basin connectivity on sediment source, transport, and storage within the Mkabela Basin, South Africa” by J. R. Miller et al.

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General comment

I wonder whether it is valid to draw conclusions for the entire catchment based on the samples described. I think the approach is valid for the upper subcatchment which has been extensively studied; however, for the middle subcatchment, only one sediment core that was sampled at an early section is described. For the lower subcatchment, one sediment core is sampled in the uppermost part of that catchment and analysed in less detail than the other cores. Soil samples have only been derived for the upper sub-

C4819

catchment and some upper parts of the middle subcatchment, potential source areas in the lower middle subcatchment or in the lower subcatchment are not considered at all. Thus, the study should rather draw conclusions for the upper but not the entire Mkabela catchment. The structure of the text should be improved to facilitate readability and general understanding of the study: Methods applied should ALL be described in the method section and it should be made clear which methods were applied to which sample. The result and discussion section is partly mixed up with the description of methods, some sub-sections seem redundant and/or very complex. I propose that this section should be tightened and results should be “carved out” more clearly. There are very few cross-references to other studies in the results and discussion chapter (only 5 in total) compared to the method chapter (and methods that are described in the results and discussion chapter). A land use map would assist understanding of the author’s assumptions.

Specific comments

P 10155 + 10156 Regarding the description of the study area, please give more information concerning - the size (in km²) of the studied catchment and the size of the subcatchments - the seasonal behavior of temperature over the year in general - the topography of the study area (differences between subcatchments, gradients...) It would be helpful to include a landuse map with the description of landuse in the catchment (line 3 ff). In addition, a short description of the soil type distribution that could be referred to later might fit well in this section (including reference to figure 6 and table 5 on soil types).

P 10156 line 17 How was the catchment subdivided into subcatchments? Line 17 suggests that subdivision is based on noted differences in landuse (which may be misleading?)

P 10156 To me, the concept of process zones does not become all clear in this section. It would help to include P10162 L13-20 here and possibly to introduce figure 5 together

C4820

with table 1. Figure 2 is of no help but rather adds extra confusion (see comment to figure 2).

P 10157 Please give more information on the SPOT images (number, acquisition dates, resolution). How and based on what was the SPOT data classified?

P 10157 L 8-28 To me, this entire section does rather belong to the introduction part than to methods

P 10157 L 21 Please give details on the sampling of sediment cores (number of cores (per sub-catchment), sampling time and location (reference to figure 3)) and sampling design (how and why were specific locations chosen?) as well as which analysis was applied to which core (reference to table 4) (see also comment P10159 L 16f)

P 10158 L 3 Why were only upland areas samples?

P 10158 L7 How was soil type assessed? In the field or based on the soil map (figure 6)?

P 10159 L 16 Either have a section 3.2 that is entirely on sediment SOURCE sampling and analysis and a section 3.3 on sediment CORE sampling and analysis OR e.g. a section on sampling and a section on analyses of sediment source and core samples. Don't give some description of sediment cores in section 3.2 and the rest in 3.3, this is confusing. Also, adapt the headlines to the content of the sections.

P10159 L21 cores TB-1 and PB-1 are never mentioned again so why mention them here?

P10159 L24 How were the cores sampled for analyses (e.g., one sample per core or one sample per section? How were sections defined?)

P10159 L27 Which cores were selected and why? How were the cores sampled for dating analysis (same sections as for geochemical analyses?)?

P10162 L13-20 This section would fit perfectly in the method part as it explains how
C4821

process zones were defined (see also comment Page 10156).

P10163 L17 from the south west??

P10164 L8 Only the "uppest part" of the lower subcatchment is shown in fig. 4. Were process units delineated for the entire lower subcatchment – if yes, they should be depicted in fig.4. If no, maybe the study area should be outlined different (since it seems the catchment was only studied to the sampling location of B2WTC1?)

P10164 L19-27 + P10165 L1-4 I have been missing this section in the methodology chapter since this analysis precedes the modelling described in section 3.4. Please distinguish more carefully between methods and results.

P10165 L3 + L21 discriminant (function) analysis?

P10165 L10 A composite of the eight elements?

P10165 L11 Why are Cartref and Glencoe soils more difficult to discriminate?

P10165 L 15 Source material samples not sediments collected

P10165 - P10168 Maybe it would help the reader to follow the explanation if you could a) print the name of the sediment core in bold letters in the text, b) describe one core per break, and c) give shorter and more intuitive (to the reader) names to the cores. At least, make sure the cores are named continuously throughout the text (e.g. P 10165 L 28: WT1-C1, Fig 4: WT-C1 and B2WTC1, table4: WT1-C and BW2TC1) Do not relate your findings to depth only OR depict depth in Figure 7 and 8. Why is BW2TC1 not described in this section? What are the major differences between the cores and what are they caused by? What is the relationship between long-term land use and soil type changes represented in the cores?

P10168 L23 Why were these two cores chosen?

P10168 L 27 Why only one 226Ra measurement (and why is this not described in the methods section?)

P10169 L18-27 + P10170 L1-4 methods again

P10170 L 13 catchment

P10170 L19-29 Longlands and Covelly soils are not visible from the map in figure 6 but in fact underlay soils in most of the catchment and thus serve as a major source of sand-sized sediment...?

P10174 L17 + P10175 L3 indirect?

Generally, refer to figures 10 a and 10 b and 11 a and 11 b Sections 4.2.2 and 4.2.4 both deal with a very detailed description of the individual sediment cores so why not place them as 4.2.3 and 4.2.4? The dating section on only one core adds confusion.

P10178 L13 was there more than one reservoir studied?

P10178 L16 Break after "upstream."

P 10185 Table 1 It is quite difficult to see which zones belong together from that table, could you change the alignment of cells or add lines?

P10186 Table 2 Explain that road samples were excluded from analyses in table title, otherwise the reader wonders about 73 vs. 63 samples. Could you also include the share of land use or soil type in relation to total catchment area (in %) in that table?

P10187 Table 3 There is an error in Part A: 3 samples were classified Gc instead of Cf (this must be wrong since the result sums up to 15 Cf samples)

P10188 Table 4 Please make sure the naming of cores in continuous throughout text, figures and tables. What was interval spacing based on (explain in text)

P10189 Table 5 Refer to this table in description of the study area

P10190 Figure 1 Runoff Plots, Gaging Flumes and Monitoring Stations are not mentioned in the study so why depict them in this figure? It might be helpful to indicate that the studied area does not include the entire Mkabela but roughly the northern half of

C4823

the catchment.

P10191 Figure 2 I find this figure very confusing since it seems to suggest that certain process units belong to different catchment types. According to e.g. figure 4 this is not so? E.g., bedrock channels belong to the middle catchment (fig. 2) but they also occur in the lower catchment (fig.4) whereas wetlands belong to the middle and lower catchment but occur in the upper catchments as well (fig. 4)

P10192 Figure 3 Include waterways and channels in figure. Do not include Pb-1 and TB-1 Why were potential source samples only collected from the top part of the catchment? Soil from lower part may also be eroded, transported and deposited downstream.

P10193 Figure 4 Include the sediment cores in legend and figure title Do not include Pb-1 and TB-1

P10195 Figure 6 The color table for the soil types is missing which makes it hard to understand the map (see also P10170 L19-29) Could you include a land use map of similar extend?

P10196 Figure 7 Names of cores (different between table 4, fig. 4, fig. 7 and text). Why do the number of samples per core differ between table 4 and figure 7? Add legend more general (not in core WT1-C2) Add total depth of core Number every second sample for all cores (for R1-C1, only every 5th sample in numbered)

P10197 Figure 8 core WET-C1 is depicted upside-down Names of cores (different between table 4, fig. 4, fig. 7 and text). Why do the number of samples per core differ between table 4 and figure 7? Add legend more general (not in core WT1-C2) Add total depth of core Number every second sample for all cores (for R1-C1, only every 5th sample in numbered)

P10198 Figure 9 On one of the two time axes, write years (0=2008, 100=1908?)

P10200 and 10202 Figure 11 and Figure 13 (Could be merged into one figure) Add

C4824

total depth of core Check naming of R1-C1 samples

Missing references Foster et al. 2012 USEPA 2000 Simon et al. 2011 Turekian 1971

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C4825