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Hydrology and Earth System Sciences
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Discussions

Interactive comment on "Is sinuosity a function of slope and bankfull discharge? – A case study of the meandering rivers in the Pannonian Basin" *by* J. Petrovszki et al.

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Dear Referees,

Thank you for your comprehensive and inspiring review. The interactive comments you wrote us had about the same content. However, the comments of Jeff Warburton were a bit more detailed and he mentioned also almost all things discussed by Tomaž Podobnikar, so mainly we used that as a backbone of the corrections.

Answers to the specific comments (in the supplement file, the original comments of the referees were also written):

1. Thank you for the recommended literature, it was very useful. Furthermore, one of the recommended authors (Chang, H. H) also studied some relation between the mean annual discharge and the bankfull discharge, so we could compare and verify our fitting method and results.

2. For a given point, the slope and discharge values were imported from the same dataset. However Viczián focused on the hilly area, so along the Great Hungarian Plain we needed other data, this was the survey of Lászlóffy et al. We completed the text with this description, (see 2.2 Slope and discharge values).

3. Unfortunately, we did not have enough data to calculate the bankfull discharge with a commonly used method. But our results were compared to the graph of Chang (1979; using the data of Carleston, 1965, and Schumm, 1968). In our new version, Fig.2b shows the two dataset and the fitted lines, with their fitting equations (see the supplement file).

4. We added the new Table 1 (see the supplement file)

5. In the present study, our goal was to describe more precisely the fitting methods, and their characteristics. Using different methods, our aim was to show the ways to generate these surfaces, from the easiest to the more difficult. Comparing the three methods, the quadratic polynomial fitting seems to be most accurate. The conclusions were rewritten to be not only a short summary of the results, but to answer to the question in the title. The RMS error of the model remains under 15%: Using the least squares regression, we build up a mathematical model. This model estimates a sinuosity value for a given slope and discharge value. We compared the model and the original sinuosity values; calculated the RMS, and compared them to the original sinuosity values. We used 202 sinuosity-slope-discharge triplets to determine the quadratic model (short statistic in the supplement file).

We have 5 more points, but we did not use them during the fitting method. These points can be found along the Körös River System, in the Great Hungarian Plain. Here, the area is very flat, but the water discharge is quite big. These points should belong to the straight pattern (see the slope and discharge values of Ackers and Charlton), but their sinuosity is around 3. In this area, neotectonically active faults can be found, which can locally change the channel slopes. We also did not use the points along the River Olt, because here multiple bedrock-controlled reaches occur. We tested our model along this river. The model values are quite similar to the original sinuosities, except the bedrock controlled reaches.

6. Thank you for this comment. We rearranged our Fig.3 and put a new map, comparing the RMS errors not only to the river patterns but to the coordinates of the points. Analysing this map, we can conclude, along the rivers, the higher errors appear near the points, where the tributaries arrive, and change the water- and sediment discharges (see supplement file).

7. Thanks for this suggestion, proposing an interesting direction to continue our research towards. Threshold, and especially catastrophe models are considered as an important part of the sinuosity evolution, e.g. in case of sinuosity decrease (with a slightly different context, see Turcotte, 1992 and Stoelum, 1996). The tight time frame to provide the revised version does not let us to work on this issue. We see, however, a real potential to complete our analysis to this direction in the future.

8. Text: All of the suggested technical corrections were made. The abstract was rewritten. The appendix was deleted, and the methodology was described in the text (see: 2.7. Least Squares regression). A linguistic review was also made on the text.

Figures: The structure of the figures was simplified. The unnecessary ones were deleted (Fig. 1.b; 1.c; 2.c; 2.d; 2.e; 3.a; and 3.c from the original version), but there are some new pictures which can help for the better understanding (1.c; 2.b; 3.b). Fig. 1.c – calculating the sinuosity with moving window method (Technical corrections: P12276, L15; Tomaž Podobnikar: short definition/description/principles or formula is needed – for example, how to calculate the sinuosity) Fig.2.b – This graph compare the mean

annual discharge to the bankfull discharge. Fig.3.b – This map shows the RMS errors along the rivers (in the % of the original sinuosity) The legends and colour scales are displayed.

Answers to the other comments: All the chapters were rewritten. All the unnecessary paragraphs were deleted from the Introduction, so it became shorter. The definition of the sinuosity and a short description of the calculation method were added. All individual comments/suggestions were followed in the final text.

Thank you your productive criticism, suggestions and comments, which helped a lot to improve our work.

Budapest, 9 February, 2015.

With special regards,

Judit Petrovszki, Gábor Timár and Gábor Molnár

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/11/C6418/2015/hessd-11-C6418-2015-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 12271, 2014.