

Review ESURF, 3, 1289-1316, 2015. Métivier et al.

Morphology of meandering and braided gravel-bed streams from the Bayanbulak Grassland, Tianshan, China

This paper focuses upon associations between channel morphology and discharge for 92 sites along single-thread meandering and braided gravel-bed channels in the Bayanbulak grassland, China. There are well established associations published in the literature between morphology (width, depth, slope) and discharge, that identify thresholds between the two morphological states. For example Leopold and Wolman (1957) identify a threshold condition between meandering and braided channels in the relationship between slope and discharge. The authors in this study compare their data with Parker et al. (2007), Church and Rood (1983) and King et al. (2004). Comparison could be made with a wider selection of studies, including Leopold and Wolman's (1957) original work on the topic.

Overall the numerical formulation and statistical treatment of the data look fine, however the methodology needs more detail, some clarification, and possibly some further justification. It appears that the authors were analyzing the morphological and discharge characteristics of threads (anabranches) from the braided channel and comparing these with single-thread meandering reaches. Surely the main conclusions concerning morphology are therefore unsurprising e.g. no major width differences in channel width. Why did the authors not survey the full active width of the braided channel; including multiple channels and bar tops? The authors need to present further rationale for concentrating on discrete threads of channel.

From inspection of the aerial images in Fig 3, it appears that meandering, wandering and braided channels may all exist within the study area, yet there is no mention of wandering. Why are the authors just working on braided and meandering channels? Are some of the sites sampled actually wandering in nature? The authors must offer a correct classification of their channel types.

Why are the morphological characteristics of braided and meandering rivers worthy of study; bearing in mind the immense volume of research already conducted in these channel types? The key finding of this study appears to be the lack of morphological differences between braided and meandering streams. The authors must make it clear what the significance of these conclusions are.

Page 1291:

Line 18, simply splitting alluvial channel types into two end members is far too simplistic, and not very helpful for future understanding. What of the wide variety of other channel typologies e.g. Montgomery and Buffington (1997), or Rosgen (1994)?

Line 22, 23, there are two spelling errors; 'developed' and 'pattern'. Please can the authors check spelling throughout the manuscript

Line 23, should Ashmore's (1991) fundamental laboratory work on braiding mechanisms be cited here?

Line 25, define 'aspect ratio'

Page 1292:

Line 7, do braided rivers have banks?

Line 10, when the authors discuss single threads – are they referring to anabranches within the braided channel? Surely if morphological comparison are to be made between braided and meandering then it is the full channel (which may comprise multiple threads, and bar tops, along a braided reach), that needs to be considered rather than isolated threads. If isolated threads from braided reaches are being compared against single-thread meandering reaches, then it is unsurprising that their morphology is similar.

Page 1294:

Line 8, what were the length of the profiles used for channel slope measurement? Where these taken along the thalweg of the channels, and anabranches?

Line 11, How many clasts were measured at each site? It is customary to use the 84<sup>th</sup> percentile of the cumulative grain size distribution in many bedload transport studies. Why is the 90<sup>th</sup> percentile used here?

Line 19, why are only these three sources used for comparison? What of other fundamental work (e.g. Leopold and Wolman, 1957)?

Line 26, Individual threads suggests that dry bar tops are not included in the braided channel cross-section - however surely they are part of the active channel, and should be included in the analysis?

Page 1295:

Line 22, Could the others clarify their argument here, concerning the role of coarse particles in controlling morphology. It could equally be argued that very fine-grained cohesive sediments also strongly control morphology

Page 1296:

Line 2, Do the authors mean isolated 'meandering' threads? Please clarify

Page 1299:

Line 1, The 'means' of what? Please could the authors clarify.

Page 1300:

Line 1, surely the behavior between single-thread meandering (with well defined banks and more cohesive sediments), should be expected to differ to that of true braided with unrestricted movement? Could the authors clarify the statement here.

Line 5, 10, There are a number of statements concerning the role of sediment transport/supply in controlling channel morphology made in the conclusions. Undoubtedly sediment supply plays an important role in controlling channel morphology, however the authors present no data on this. Rather than make comments concerning sediment transport, the authors should concentrate on the conclusions they can make from the data presented in the paper, and highlight the significance of these findings.

Tables 3 and 4, There appears to be very little difference in some of the grain size metrics (D50 and D90 values) and slopes between some of the sites. In fact many are identical. However the channel dimension and hydraulic data differ markedly between the same sites. The two do not stack up! - Surely there must be differences between sites? Could the authors make some comments on this?

#### References:

Ashmore PE. 1991a. How do gravel-bed rivers braid? *Canadian Journal of Earth Science* 28: 326–341.

Leopold LB, Wolman MG. 1957. *River Channel Patterns: Braided, Meandering, Straight*, United States Geological Survey Professional Paper 282B.

Montgomery D. R., Buffington J. M. 1997 Channel-reach morphology in mountain drainage basins, *Geol. Soc. Am. Bull.*, 109, 596–611.

Rosgen, D.L. (1994) A classification of natural rivers. *Catena*, 22, 169-199.