

Interactive comment on “Perspective – synthetic DEMs: a vital underpinning for the quantitative future of landform analysis?” by J. K. Hillier et al.

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The authors make a good case that synthetic landforms are part of the armory of geomorphological modelling. Synthetic landforms and landscapes are not widely used and this paper should encourage geomorphologists to use them. The advantages and limitations of synthetic DEMs are usefully discussed.

Readers will find the combination of ideas and examples from different fields useful. The juxtaposition of statistical synthetic DEMs with landscape evolution models is interesting and could be developed in greater depth, as could the typology: probably further distinctions can be made. For example, a different type of synthetic relief was generated by Griffin:

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Griffin, MW. 1987. A rapid method for simulating three-dimensional fluvial terrain. *Earth Surface Processes and Landforms* 12(1), 31-38. [Special issue on ‘Theoretical Geomorphology’]

I would assert that models need to be tested against real topography, whether or not synthetic DEMs are used to provide complementary tests. They should not be regarded as alternatives. Some complexities of testing different algorithms for surface metrics are illustrated in –

Minár, J., Jenčo, M., Pacina, J., Evans, I. S., Minár, J. Jnr., Krcho, J., Kadlec, M., Burián L., & Benová, A. 2013. Third-order geomorphometric variables (derivatives) – definition, computation and utilization of changes of curvatures. *International J of GIS*. 27 (7), 1381-1402. <http://dx.doi.org/10.1080/13658816.2013.792113> and-

Minár, Jozef, Minár Jozef Jr & Evans Ian S. 2015 Towards exactness in geomorphometry. In: Jasiewicz J., Zwoliński Zb., Mitasova H., Hengl T. (eds), *Geomorphometry for Geosciences*. Adam Mickiewicz University in Poznań - Institute of Geoecology and Geoinformation, International Society for Geomorphometry, Poznań, *Geomorphometry2015*. geomorphometry.org 27-30.

Real and artificial surfaces do tend to give different results!

Fig.3 shows that visually the simple model seems an excellent fit. Never the less the profiles in b) show a systematic deviation which is worth commenting. The real profiles have a sharper basal concavity than the model: presumably this betrays the operation of a different process.

DETAILS: page/line

Some sentences need to be reworded or simplified for smoother reading.

2/10-11 can this be rephrased to avoid the inverted commas, which may turn off some readers?

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3/16 rephrase: it is 'bedforms in flow-sets' – not size of flow-sets.

3/19 'fundamentally random' is an exaggerated interpretation.

3/20 replace 'similar' – be more specific.

3/22 'are identified'

4/19 combine the brackets – don't use 'e.g.' twice.

6/20 'have uncovered' implies availability of real examples: these should be cited, instead of the hypothetical '50%'.

7/4 and 7/11 again, combine the brackets – don't over-use 'e.g.'.

8/7 is "only possible to test their efficacy..." an exaggeration?

9/21 'investigation and'

Section 3.1, last para. An early demonstration of the inadequacies of fractal models was –

Evans, I. S. & McClean, C. J., 1995 The land surface is not unifractal; variograms, cirque scale and allometry. *Zeitschrift für Geomorphologie*, N.F. Supplement-Band 101, 127-147

10/16 and 18/26 'Harbor'

11/0 Is anything perfect? Better 'Further improvements are awaited', Or (10/23) 'Several difficulties prevent these models as yet from being ideal solutions.'

12/12 To what does 'they' refer? – apparently bedforms, but probably not?

13/2 avoid "to test against synthetic DEMs" – not what you mean?

13/26 perhaps 'are not used on the basis that...'

14/7 not "and perhaps: better, '... property and its scale variation is key, it can...'

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14/15-19 sentence needs simplification.

14/23 'later be'

Fig.1 As the ln scale tends to be opaque to non-mathematicians, I would prefer a log10 scale, or best, actual counts on the y-axis.

Fig.2 I did not find this compound figure useful.

Fig.5 what is the extent of c)? a) is dimensionless but b) would appear to have dimensions.

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