

***Interactive comment on “A high-resolution global dataset of topographic index values for use in large-scale hydrological modelling” by T. R. Marthews et al.***

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Title: A high-resolution global dataset of topographic index values for use in large-scale hydrological modeling

Authors: Marthews, T.R. et al.

Journal: Hydrology and Earth System Sciences

Reviewer: Enrique R. Vivoni, Arizona State University

Summary:

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The manuscript describes the development of a new global dataset on the topographic index derived from the HydroSHEDS database which itself is a packaged product from the SRTM dataset. The product appears to be a valuable contribution that will be used by data analysts and modelers working at large scales. The authors present well their work and illustrate it effectively by presenting some interesting comparison to prior efforts (HYDRO1K CTI). I also liked that they brought in their personal motivation related to estimating wetland areas into their analysis of the global dataset. Overall, a nice paper and the authors should be commended. I suggest some minor revisions in the follow and also encourage the authors to reduce repetition and the overall length, where possible, as a shorter piece will have greater impact. Care should also be taken with the scales and resolutions mentioned as these can confuse readers (high-resolution vs. coarse, mesoscale versus sub-mesoscale, 60-300 km vs. 1-10 km).

Minor Comments:

Page 6140: Please define the acronym GA2 in the abstract.

Page 6140: Please expand upon the references to support the definition of LSMs, including models that are soil-vegetation-atmosphere transfer schemes and those that would be classified as macroscale hydrology models. (I noted later that additional references are placed in the following page, suggest to include some of those in the first sentence.)

Page 6140: LSMs can have a range of resolutions down to  $\sim 1$  km, thus the use of the range of 60-300 km can be misleading. (I noted later that the resolutions are indicated to be approaching 1-10 km, thus please avoid the range of 60-300 km used in the second sentence).

Page 6141: Wood et al. (2011 and 2012) are not really about specific models. These are opinion or response to opinion papers. Please provide some references of LSM studies at high resolution that are used at the catchment scale for water resources or climate change investigations.

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Page 6141: For clarity, please define 'sub-mesoscale'

Page 6141: The term 'statistically-generalized' could be replaced with 'distribution function'. See Beven (2000) book for nomenclature.

Page 6143: The acronym LSM need not be continuously defined. Once in the first occurrence of the term is sufficient.

Page 6144: Is there any special treatment or masking for other problematic areas such as croplands, urban zones, mines/quarries, wetlands, etc. that might have significantly altered flow paths?

Page 6145: An estimate of the number of pixels in the global layer and the approximate file size would be useful to report to justify the need for the cluster resources.

Page 6145: It is more appropriate to refer to Figure 1 first and Figure 2 second and so forth.

Fig. 1: Can the authors use a color bar that more clearly illustrates patterns at the global scale?

Page 6145: It is more appropriate to refer to Table 1 first and Table 2 second and so forth.

Page 6145: It is important to indicate if this statement "indicating that wetlands in these areas are maintained by factors other than topography." refers to the former (in Asia) or latter (in Canada/Russia) wetlands.

Page 6147: The more appropriate term is 'general circulation models'

Page 6147: There is quite a bit of repetitious material between this quite lengthy discussion and the introduction. I suggest to tailor this discussion back to the essential elements learned from the study and not the generalities more appropriate for the introduction.

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Page 6148: What are ‘knock-on’ effects? Define or use a more common term.

Page 6149: The authors should expand upon the limitations of the TOPMODEL approach and topographic index for regions where the saturation-excess runoff assumed in the theoretical development is not the dominant mechanism. Such mismatches between field hydrological processes and model assumptions lead to divergences in the topographic index interpretation, such as that shown by having high TI in Subsaharan Africa and Australia in Fig. 1. How valuable is the global map of TI if the underlying processes do not support its application in large areas?

Page 6150: The product is at ~500 m resolution, about 5 times or 10 times larger than proposed by Wood et al. (2011).

Page 6150: The last paragraph is a repetition of material from the introduction and can be excluded without any loss of information.

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