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Hydrology and Earth System Sciences Discussions

Interactive comment on "Geomorphometry of drainage basins: a global view from the Shuttle Radar Topography Mission" *by* P. L. Guth

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GENERAL COMMENTS: A computational tour-de-force, this short paper advances the discipline via the author's well-respected MicroDEM approach to quantitative geomorphology. His succinct information-rich overview yields a statistical 'snapshot' of Earth's surface drainage featuring a multi-parameter morphometric summary illustrated by selected measures. The analysis includes more than 26,000 watersheds of over 100 sq. km derived from the HydroSHEDS project, a reworking of the 15" DEM from the Shuttle Radar Topography Mission (SRTM). The paper's appendix lists all 42 parameters, from the commonplace (e.g. mean slope) to the exotic (e.g. nugget variance), and describes the 10-step process by which the numerical results were obtained. In addition to contributing the valuable color-coded correlation matrix of 42 descriptors of basin

geometry, the paper offers a sampling of several full-color global and regional maps (Strahler order, elevation-relief ratio, etc.) and a plot of channel thalwegs for Earth's 25 largest watersheds.

SPECIFIC COMMENTS: Sections 2 and 3 briefly address a sampling of issues and observations concerning the processed SRTM data and results that yield global hydrogeospatial information in unprecedented volume; these few pages should be read carefully, for they will provide useful hints to readers attempting follow-up analyses of such large datasets.

One problem with this succinct journal-published outline of such a heroic volume of new cartographic information (more an "extended abstract" than a "paper") is the accompanying 5 parametric maps. They are impossibly small and thus of little value for subsequent study; a pity, because they are important! Readers should have digital access to these maps plus those for the remaining 37 basin parameters, so that only one's in-house plotter–not a journal page–limits map size and content detail.

Despite its heroic computation, this paper presents just the cream skimmed from a vast pool of morphometric milk that lies unaddressed beneath. A good start to building on this remarkable introduction would be detailed study and analysis of the correlation matrix–no trivial endeavor. (Full disclosure and admission: I still have yet to fully discuss the 49 x 49 parameter matrix created in the 1970s and presented briefly in a 1987 NASA PGPI abstract and more in a 2001 ICG-Tokyo abstract.) Among obvious options for subsequent analysis are tabulated descriptors of Earth's principal watersheds and their relation to various spatially distributed tectonic and geomorphic influences.

Peter Guth has opened the mine; much gold remains to be extracted.

TECHNICAL CORRECTIONS: While I detect no obvious conceptual or computational problems, the reference list is fine, and the (sometimes terse) writing is usually clear, this excellent little paper nonetheless shows a few signs of hasty preparation:

Most evident is the absence of any mention in the text–let alone discussion–of Figures 4b and 4c, which address basin area on p. 1932. I found the explanation of Figure 6 difficult to understand, both in the caption and in the text on p. 1933, lines 21 & 22; readers will appreciate the clarification. On page 1935 in Conclusions, the meaning/intent of "Because most parameters depend on the scale of the data used for computation(s), these results cannot be compared to other studies" escapes me; rewriting/rethinking is needed. On page 1934 line 18 in the Discussion, author Suzanne Wechsler (2007) would appreciate being cited as "She", while on page 1939 line 12, the canonized Robert E. Horton will cease turning in his grave when the "e" in his surname is corrected to "o".

Besides the usual generous number of suggested stylistic improvements to the text (available from the reviewer upon request), I recommend the following: - halve the Fig. 8 matrix, from a square to a triangle, to eliminate redundancy; - for the title, try "Drainage basin morphometry: a global snapshot from the Shuttle Radar Topographic Mission"; - Because the data in this paper are intrinsically geographical, the redundant "geo" in "geomorphometry" can be struck throughout.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1929, 2011.