Hydrol. Earth Syst. Sci. Discuss., 7, C3372–C3375, 2010
www.hydrol-earth-syst-sci-discuss.net/7/C3372/2010/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Spatial variability in channel and slope morphology within the Ardennes Massif, and its link with tectonics" *by* N. Sougnez and V. Vanacker

Anonymous Referee #2

Received and published: 8 November 2010

The paper presents an analysis of several morphometric indices and their relation to tectonic uplift. The authors conclude that channel slope and channel morphology can be use to identify areas of transient adjustment of river morphology due to tectonic uplift.

The manuscript is well written and illustrated, and although the text may be easy to read for those familiar with the geography of the Ardennes, it can be a little hard for most readers. In general, the paper is interesting and well-suited for this Special issue of HESS, although more detail is needed about the morphometric indices investigated

and their relation with the local geology, a subject that was not explored.

GENERAL COMMENTS

This work is based on morphometric variables that were derived from a DEM. The authors comment that the original DTM at 1:10000 scale is a regular grid with 20m resolution and that it contains interpolation artifacts, so the contour lines were reconstructed from the DTM and re-interpolated (probably with the same resolution, but there is no mention of it). First there is a conflict with DEM and DTM. If this is a model constructed from photogrammetric-derived contours, I would say it is a DTM, since it represents the ground surface. Second, if the original data contains artifacts, should't the reconstructed contours present these artifacts as well? What impact this could have in the resulting re-interpolated DTM?

The reconstructed contour lines were interpolated using ArcGIS' topo to raster. What about other interpolation methods? Could this step alter significantly the results? A discussion on DEM-creation methods and its relations with hydrological parameters is valid here (see the interactive comment by Salvatore Grimaldi on this subject as well).

In item 2.3, morphometric parameters, the indices of Gravelius, Schumm and Horton are cited, but not explained. Even if the authors feel that these indices are "classical", they still need to be properly addressed. At least on paragraph is needed to explain each index, how it is calculated and what it represents. Still in the first paragraph of this item, the authors mention that the local relief was calculated in a 100m moving window. In GIS, one can use moving-windows or roving-windows, which can lead to different results. Although it seems to me they used moving-windows, it is worth to check. There is a recent review on this subject by Grohmann & Riccomini (2009).

The slope-area diagrams cited in page 6987 need to be explained. How are they constructed? Are there references or is this original?

One major issue in this work issue is that 10 catchments were selected. But some

questions arise: How were they choosed? Why these and not others? This is not clear in the text and should be. Also the low number of catchments may pose difficulties for statistical comparison, for instance. This problem can be illustrated with the sentence (section 3, results): "The catchments in the western and southern part of the Ardennes Massif are more prone to have relatively smooth river and channel profiles, although various exceptions exist." With 10 catchments to compare, "various exceptions" may be too much to get a valid conclusion!

In section 4, discussion, the authors say that figure 3 "clearly" show "that the 20 knick zones in the tributaries of the Meuse River are located at different heights, with the highest knick zones located in the northeastern part of the Ardennes Massif." Here we have the problem of authors writing about an are which they know really well, but forgetting that others don't. I don't know what is supposed to be the print size of figure 1, but if this is your only location map, it must be better, the names of the rivers and catchments must be very clear to the reader that are not familiar with your area.

Another thing I missed was a geological map, ideally encompassing the same area as the map of figure 1. This would facilitate the understanding of the local tectonic setting and how it may be influencing the catchments. Still on the third paragraph of section 4, it is said: "This suggests that the response of the fluvial system was strongly diachronous, and that a transient signal of adjustment is migrating from the Meuse valley towards the Ardennian headwaters." The response of the catchments, as indicated by knickpoints elevation and spatial distribution, could be diachronous, but why? Is there differential uplift? Are there active faults in the area that could be responsible for this?

SPECIFIC COMMENTS (according to pages and lines in the proof)

6894,3: replace "till" by "until"

6894,26: remove "even"

6989,3: remove "Obviously"

6993,6: change "equilibrium long" by "long equilibrium"

6994,16: replace "is an" by "are" ?

References

Grohmann, C. H. & Riccomini, C., 2009. Comparison of roving-window and search-window techniques for characterising landscape morphometry. *Computers & Geosciences*, 35:2164–2169.