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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

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This suggestion made by S. Grimaldi on DTM pre-processing was really useful. The description that was given in the previous version of the manuscript was not sufficiently developed. We now include more details on the pre-processing of the topographic data in the text.

Due to an incorrect interpolation, the DTM provided by the Geographic Institute of Belgium (20m resolution) was facing some issues: flat areas in the large valley plains, sinks inside the narrow valleys, and staircases along the steepest hill slopes. We re-

moved those terrain artefacts by using the following ArcGis Spatial Analyst tools. First, we used the "Contour" function to reconstruct the initial levelling curves of the DTM, knowing the digitalization scale (1/10000) and the vertical equidistance between the initial curves. Then, we used the "Topo To Raster" tool to reinterpolate the contour lines in a 20m resolution DTM raster [1][2]. In this method, additional information (constraints) was used to optimize the interpolation (i.e.: hill top point features and linear ridges) to produce a higher accuracy DEM. Afterwards the Hydro-Tools ArcGis extension, written by Schäuble (2000)[3] has been used to remove the last spurious sinks in the DTM (Filling-Sink tool). In the same time, a newer sink identification and filling method described by Wang and Liu (2006)[4] was used on the elevation data (this module was provided into the SAGA-GIS program in his 2007 version). We compared the DTM produced by this method and the one produced by the Hydro-Tool function. Because less than 2% of the total pixels were different between the interpolated surfaces and because those differences were significantly (95%) lower than 0.5 meters, we decided to keep the first interpolated surface derived by Hydro-Tool.

The channel network has been identified using the "Flow Accumulation" ArcGis function on the corrected DTM. This function uses the Deterministic-8 approach to create a linear flow raster. To create the channel network raster, a threshold has then been set on the Flow Accumulation raster. This threshold has been specifically set for each main stream depending on the river source location (geo-referenced Google-Earth, and Orthorectified PPNC [5] images were used to precisely locate the main river source). Finally to avoid parallel flux lines, the "Stream to Feature" [6] ArcGis module has been used to obtain stream shapefiles that are closer from the real network.

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