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Hydrology and Earth System Sciences Discussions

Interactive comment on "Semi-automatic extraction of lineaments from remote sensing data and the derivation of groundwater flow-paths" *by* U. Mallast et al.

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Reply to Reviewer 2 – RC 766

We would like to thank Reviewer 2 for the comments and contributions to our manuscript. In the following we would like to answer the questions and to give our opinion to the remarks.

Reviewer Comment

There are a lot of "assumptions" in this paper. For example, in page 1405, line 18; page 1408, line 11; page 1409, line 26; page 1411; line 27; page 1410, line 4; page 1412,

line 26; page 1415; line 2. It seems like without these assumptions, this approach may not work. Could the authors make some comments on that and maybe have one paragraph in the discussion or the conclusion regarding those assumptions?

Answer

Before reading this comment it was unclear that we have used the word assumption so often. But it is true and we will comment on that and carefully think on adding a paragraph in the revised manuscript. Even though we have to assume some aspects the proposed method will work, which will be clear after reading the next lines page 1405, line 18 – the used ASTER GDEM has a spatial resolution (GSD) of 30x30m. This means only features that are of similar size can be included in this DEM. Streets in that region usually have less than 20m width. Buildings, e.g. in Jerusalem do have similar sizes, but those buildings if recorded represent rather single pixels and are not connected on a larger scale. With the smoothing function that we applied in the first step (30x30 median filter) those single pixels that might represent man made-features are smoothed and do not effect our linear filtering result. Therefore, we could also write "which represent topographic features" page 1408, line 11 – erosion in many cases needs a trigger to erode material. Once the earth crust is weakened and cracks formed due to tectonic processes (earth quake, plate movement etc.) water and wind among others can erode more material and form topographic gradients that are linear surface features. Erosion therefore is only the second force that enhances linear structures but the first force is tectonically induced. Additionally, erosion decreases structure linearity and can therefore ruled out. Page 1409, line 26 – the assumption of lineaments closer to wells reflect probable hydraulic flow conditions is correct, since we cannot know exactly where the groundwater flows. However, we think this assumption is not devious. Page 1410, line 4 – the assumption of all water wells producing water is correct as well. Unfortunately, we do not have information on water level or situation of every well. Nevertheless, since the used wells are water wells they are either still in use or if they have fallen dry, this does not degrade our statement, since we only want to investigate

the flow direction. Page 1411, line 27 – this assumption represents a hypothesis that was raised earlier and falsified at that location Page 1412, line 26 – this assumption is not related to the method, but rather used to explain certain orientations of lineaments in terms of tectonic origin Page 1415, line 2 – this assumption is again not directly related to the method. Here, it is tried to define the drawback and the limits of the method in terms of the age of structures reflected by lineaments

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Reviewer Comment

The authors have mentioned the man-made features are excluded in ASTER DEM so if use the approach proposed by the authors into the urban areas, how much uncertainty will be? On the other hand, can this approach be applied for the globe?

Answer

The reviewer is right. The method could be applied globally, but only outside densely anthropogenic structures such as cities and road networks. . We will amend the manuscript accordingly.

Reviewer Comment

In page 1409, line 17, a buffer of 300 m is used; how does this number come out? Is it sensitive to the result? Please comment on this.

Answer

The buffer is chosen based on experience. However, during the investigation it turned out, that it is insensitive to the overall result, as morphological lineaments (geological and fluvial) and geological lineaments show similar characteristics.

Reviewer Comment

In page 1415, line 25; “Thus, based on these correlations it can be inferred that the flow-path map is valid.” This sentence (approach) is not solid enough. Can the authors use some statistical tools to compute their correlations or have some numbers not just from eyeball saying there are some correlations?

Answer

We agree with the reviewer that it would be more robust to have certain numbers to either validate this expression or falsify it. Nevertheless, the used term “correlation” is misleading and wrongly applied here. We will change that in the revised manuscript. Nonetheless, the modelling results from Guttman (2000) and Laronne-BenItzhak & Gvirtzmann (2005) cannot be quantitatively compared to our results due to two reasons. First, we visualized our groundwater flow-paths simply by arrows that indicate the general flow directions. The modelling results are raster based. Second, we scanned the modelling results from the respective paper which has a crude resolution and georeferenced it afterwards. If we consider only the failure due to this process the result is impaired to an extent, where in our opinion a reliably correlation is not feasible anymore.

Specific comments:

We agree with the reviewer that especially in the methodology section the parentheses and the abbreviation do not improve the reading and understanding. We will remove both, where it is possible.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1399, 2011.