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Interactive comment on "Topography-based flow-directional roughness: potential and challenges" *by* S. Trevisani and M. Cavalli

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Reviewer P1400L5: Please specify which process and factors

Authors: We are referring generically to the different geomorphic processes and factor that can be potentially involved in the shaping of landscape.

Reviewer P1402L18. I would not present figures in the introduction. If you need do describe this, do it in material and methods.

Authors: We prefer to maintain here the figure, because of it is a conceptual one which describes the key ideas of the paper. In the method section, we prefer to focus on quantitative and mathematical aspects related to the implementation of these ideas.

Reviewer. P1402L27-28 P1403 L1-6. You can delete this. be objective in the introduction. No need to describe so many previous works.

Authors. We removed the sentence related to previous works (In the new marked text page 3, lines 24-29). However, one of the main motivations that inspired us to develop flow-directional roughness is the anisotropy in surface roughness that often is a characteristic and distinctive component of fine-scale morphologies (as highlighted in the cited paper). Trevisani, S., Cavalli, M. & Marchi, L. 2012, "Surface texture analysis of a high-resolution DTM: Interpreting an alpine basin", Geomorphology, vol. 161-162, pp. 26-39.

Reviewer P1403 L15-24. Divide this in aim and specific objectives.

Authors: We rephrased to include specific objectives (In the new text page 4, lines 11-15).

Reviewer P1403 L25-29. Move this to materials and methods.

Authors: We moved in materials and methods and rephrased accordingly (in the new text page 4, lines 26-30).

Reviewer P1404 L9-10. Delete this. You mentioned if before. Authors: Deleted.

Reviewer P1409L13. Dataset description should come before MAD and computation of flow-directional roughness

Authors: We prefer to maintain the present structure of the paper because of the datasets presentation is functional to the use of the developed methodologies, which are the kernel of material and methods section.

Reviewer P1411 L20 Is this the Root Mean Square Error? If yes write it

Authors: Done

Reviewer P1412L11 Is it possible to provide an histogram of the errors, instead of a

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table. it would be easier to see the distribution.

Authors: As also requested by reviewer 1, we inserted for all the tables a related box-plot. However, we are not dealing with errors but with a residual DTM

Reviewer P1412L15 and L21-22 This needs to be measured and ploted. Would be possible to provide the correlation between both indexes?

Authors: We reported the correlation coefficient (0.966, at page 11 line 29 in the new text). We avoid to insert a scatterplot given the strong correlation, that is expected since both indices are measuring spatial variability of residual elevations.

Reviewer P1412L27-29 You could compare if these differences are statistically significant. This is other reason why a scatterplot showing the correlation between these indexes would be helpful

Authors. We think that this kind of test performed on a global level would be not particularly explanatory. We think that the crucial point is to analyze these differences with morphologies locally. Moreover, see reply to M.D. Hurst regarding DTM accuracy.

Reviewer P1413 L3 A Morans I analysis would help to see if these errors have some specific spatial pattern (dispersed, random or clustered)

Authors: We are not dealing with errors (e.g., coming from an interpolation). Moreover, a Morans I analysis will be not too much useful to describe the patterns of differences at global level. First of all, because of the important point is to analyze the patterns of differences in comparison to local morphologies. Secondly, the patterns of differences are too complex to be described by means of a Moran I analysis (for example, the patterns are characterized by high anisotropy). We should use a variogram map (or MAD), but, again, not computed globally but on a moving search.

Reviewer P1415L5-6 Can you provide the RMSE results of both indexes?

Authors: We cannot provide the RMSE of the indexes because of we did not performed

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an interpolation from which calculate a RMSE (e.g., by means of cross-validation).

Interactive comment on Earth Surf. Dynam. Discuss., 3, 1399, 2015.