

Interactive comment on “Geomorphometric analysis of cave ceiling channels mapped with 3D terrestrial laser scanning” by M. Gallay et al.

M. Gallay et al.

michal.gallay@upjs.sk

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We apologize for the misunderstanding which is caused by the PDF reader version. We were not able to see the comments. We could see just the highlighted text. However, now this problem is fixed and I am sending the answers referring to the RC3 and RC2.

— Page 2 line 31: The highlighted sentence will be rephrased to:

This paper also provides new evidence of the hydrological regime acting during the cave formation.

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Page 6 line 10-13: The highlighted sentence will be rephrased to:

Bella et al. (2014) performed cosmogenic nuclide dating of quartz pebbles cemented in
C1

the upper parts of Domica (340 metres a.s.l.). Their results suggest that the upper level (338-340 m a.s.l.) began to form after uplifting the region above sea level earlier than the Middle Pliocene (3.47 ± 0.78 million years) when the current hydrographic network was being established. The middle level is located 10-12 m below the uppermost level. The lowest evolution level of Domica was found at one place by drilling at 318 metres a.s.l. (Droppa 1972).

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Page 7 line 8: The highlighted word will be deleted.

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Page 7 line 15: We will include the statement on the total area measured.

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Page 8 line 5-6: The highlighted text will be rephrased to:

Two data sets were derived by subsampling with the criterion of minimal distance between two points. This means that the points are not closer to each other than the specified value. The points were reduced having a minimal spacing of 1 cm and 5 cm, respectively.

— Page 8 line 23: The highlighted text will be rephrased to:

Cignoni and Ranzuglia, 2014

The surname Cignoni will be used throughout the paper to correct wrong spelling of the author Paolo Cignoni. The RC2 comment for this item asks about the triangulation method. The lines 22-34, page 8, explain the creation of the 3D triangular mesh. It is the Poisson surface reconstruction algorithm by Khazdan et al. (2006) which was used. It was not the Delaunay triangulation which uses all input points. Poisson surface reconstruction approximates the real surface from input points. First an indicator function is generated from a point set. This function serves for extracting an isosurface

based on a chosen indicator function value. This value is decided so that the isosurface approximates the positions of the input points as close as possible. The vertices of the resulting 3D mesh are not coincident with the input points as it is in the Delaunay triangulation.

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Page 9 line 2-3: The highlighted text will be rephrased to:

It is the maximum depth of the octree hierarchy that is used for surface reconstruction by fitting an indicator function modelling the 3D surface. The method adapts the octree to the sampling density, therefore the specified reconstruction depth is only an upper bound.

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Page 9 line 5: The highlighted text will be rephrased to:

decimation of the mesh, or the mesh parameterization.

This issue will be described on Page 8 line 5-6 according the revised text as stated above.

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Page 9 line 7: The highlighted text will be rephrased to:

data sets originated from subsampling the original point cloud at

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Page 9 line 23: The highlighted text will be rephrased to:

Also, the ceiling channels were extracted as polylines by the means of traditional raster-based algorithms and map algebra (2-D geomorphometry).

The sentence concerned here is just indicating that traditional 2-D raster based geo-

C3

morphometry was used. The algorithm, in particular, is specified on page 10, lines 10-20.

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Page 10 line 10: The highlighted text will be rephrased to:

a normalized ceiling height (DEM_CH_NORM)

The comment also requested explanation of the influence of higher altitude values on to the calculated costs. Before we applied the normalization of altitudes, the calculated cost values according to the approach of Hardin et al. (2012) were very small and GRASS GIS truncated such small values. Therefore, we applied normalization. It is true that our modification is suitable to finding ridge lines-like lines on forms with a relatively low difference (tens of meters, e.g. a dune). If the relative difference is bigger (RC3 has provided calculation), a different constant, perhaps a different computation algorithm, should be used. The beauty/benefit of the Hardin et al. (2012) approach was that it finds the line connecting cells with highest values between two points. Because there are some chimneys or stalactites (both are vertical features in the cave ceilings) the line honors their presence. We tested the flow routing algorithms, but this has not yielded such realistic results as the least cost path approach.

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Page 10 line 13: The highlighted text will be rephrased to:

The higher is the constant the smoother the line will be extracted.

The comment was answer for the previous item Page 10 line 10.

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Page 10 line 29: The highlighted text will be rephrased to:

ceiling channels

C4

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Page 11 line 9-10: The highlighted text will be rephrased to:

However, more powerful measures than interactive shadowing can be calculated to improve perception of the 3D shape and to help identifying the features.

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Page 13 line 6: The highlighted text will be rephrased to:

youngest evolution level of the Virgin passage developed at about 329 m a.s.l. (segment A in Fig. 8).

The related text in chapter 3 will be rephrased to avoid misunderstanding as it is suggested for the item Page 6 line 10-13.

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Page 14 line 11: The highlighted text will be rephrased to:

and also it is the highest among the three groups.

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Page 14 line 30: The highlighted text will be rephrased to:

the 26 channels

We will correct the number of channels. there are 26 channel features identified.

— Page 15 line 1-2: The highlighted text will be rephrased to:

tectonic movement also suggested by formation of massive chimneys disrupting the horizontal continuity of the channels (Fig. 10B).

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Page 15 line 30: The highlighted text will be rephrased to:

C5

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Page 41: the comment will be implemented in the figure accordingly. The highlighted text in the figure caption will be changed to:

Domica ceiling which were grouped

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-74, 2016.