Dear Editor,

We performed most the requested modifications. As we fully rewrote more than 50% of the paper, it is difficult to answer some comments specifically, because the clarifications concern several parts of the text. Thus we are indicating the way it has been answered (in blue).

In addition, we think that looking at the present literature this paper must be considered as a preliminary study showing the potentiality of such study to capture erosional phenomenon, which is still poorly documented in the literature.

I hope this paper is now acceptable for your journal.

Sincerely yours

Michel

1 Answer to Anonymous Referee #1

Received and published: 28 March 2014

Soil erosion in badlands is a major environmental problem and therefore the topic of the study to investigate different processes at the millimetre scale is an interesting question. The authors present an exciting experiment. Unfortunately, I am a little concerned that the results are not really discussed accurately, so I cannot recommend publication right now. However, if the results on the identified processes are brought into an adequate scientific context, the authors should be invited to resubmit a manuscript.

General comments:

While the chapters "Introduction" and "Data acquisition and processing" contain some informative citations, non are found within the following chapters, where the results should be discussed based on the existing literature.

This has been included now

Three citations mentioned in the references-list cannot be found within the text.

This has been checked (a paragraph was missing)

It is recommended that non-native speakers have their articles checked by a native speaker.

This paper has been corrected by experienced article writers

Specific comments:

Already in the introduction, an important aspect "splash erosion" should be mentioned.

We are now mentioning this aspect

Soil physical properties are ignored completely, although besides rainfall soil texture is a main component concerning the observed processes.

Description of soil is added

It would be interesting to have more explanation about the three month drying, compared to in situ drying situations (soil moisture content?).

The natural conditions can be very dry as mentioned by some authors and observations

Table 1 is not mentioned in the text. The authors decision about "unnecessary points" is not clear (at least up to 22%).

This has been clarified

Swelling has been measured as 1.5 to 3mm. Is it possible to give a value for creeping?

No, and this is now explained

If FWHH is stated it should be declared "full width half height"

ok

Probably it would be better to split Fig 4. The observed processes would be more easily to detect, if all sections would be turned upright.

This is done

Is it possible that both graphs show the same section A-B, shouldn't graph II. Compression & Creeping be C-D? Graph I. Micro-Landslides has axis values in [m], graph II. Compression & Creeping in [mm] with a similar range, is this correct?

Modified accordingly

The explanation of the observed processes in the text associated with fig 4 is somewhat confusing (swelling of the ground (Fig. 4, III) or (Fig. 4, II and IV)?.

Completely rewritten

Technical corrections:

There are some typing errors, which can be easily found using a spell aid. (dimensionnal, colors, metallic, : : :) others should be carefully traced (e.g. Oostwood, : : :)

Yes for some cases, others depend on the dictionary used (UK or US)

As mentioned at the general comments it is recommended to have the article checked by a native speaker. (e.g. has been extract from; with a measurement of 5.2 mm; the potentiality; installation covers by a tent, : : :)

This paper has been corrected by experienced article writers

2 Answer to Anonymous Referee #2

Received and published: 3 April 2014

The research described in this article is very interesting because it addresses the question

1 Overall comment

The research described in this article is very interesting because it addresses the question whether or not erosion/deposition processes can be quantified with TLS/LIDAR technology. The measurement undertaken by the authors is done according to an interesting set up, allowing them to study the behaviour of a soil surface under circumstances that are close to natural. Data analysis and interpretation however is not easy for this kind of measurement. According to me, the authors have not studied the observed changes at the soil surface in a structured/methodological way that would allow them to draw generic conclusions about the different processes. I have ordered my spedific comments into questions according to the theme they address.

The remarks about methodology will help us to improve the paper, but we will not be able to produce generic conclusions. The object if this short note is more related to underline the processes that can be observed with new techniques such as Lidar. We were not expecting such results, and above all to highlight the micro-processes that are important for mass movements at micro-scale and also for infiltration. The goal is to open a door toward potential observations. Such topic will provide a lot of work for researchers, because it will improve the knowledge on the processes of saturation and deformation of the top soil. The paper does not pretend to solve these problems.

2. General remarks

- This article would benefit from a review by a native English speaker.
- This paper has been corrected by experienced article writers
- Did you measure the weight of the box before and after? It would be interesting to compare this to the observed swelling rates.

No, but some explanations are given

- Please include a small description of the soil profile, at least a textural analysis.

This is now added

3 Differentiating processes

- The study claims to have differentiated processes that influence soil surface morphology in different ways. This differentiation appears to have been performed by visual inspection of one or several instances of these processes. I strongly recommend that the processes are first described. E.g. the process labeled as surface creep could also have been the result of particle detachment and deposition.

We followed this suggestion and we tried to differentiate observation and interpretation.

- The total swelling has been calculated rather precisely. Presumably, this is the average for the entire surface of the box. How can the swelling be differentiated from particle

deposition if both processes result in the same observed change in the soil surface. /enditemize

Because it rises up and is reversible as explained now

4 DEM creation

- Why first the IDW and then getting the data into a grid?

This is now indicated

- What was the resolution of the final DEM?

2 mm, it is now introduced

- What is the 'manual cleaning' in l. 10, p. 2266?

We detailed the procedure

- Please motivate the threshold value for the definition of noise on l.22, p.2266.

Trial and error, this now explained

5 Analogical model

The analogy between processes at the landscape and micro-topography scales is not self-evident. It would be very interesting to read about how the analogy between these spatial scales is utilised for process understanding/quantification.

We did not use the term "analogy", we do not follow exactly this remark, but the new version must have clarified this point.

6 Graphs and figures

- Table 1: How is the RMS calculated and can the increase over time be explained (depending on the resolution, this is contrary to the expected trend)?

This was removed

- Fig.1 does not add any information to 2a/b.

Figure removed

- Fig.4: Is there no accumulation of sediments at the bottom of the box? So no erosion observed? Please give your interpretation or

This is explained in the experiment settings

- Fig.5: Precipitation (not 'rain precipitation'): what is the 'total rain precipitation' if it is not cumulative or the intensity?

- This is now clarified
- Compression and creeping: what is the unit here?
- Relative as indicted in the legend
-
- Swelling: is this cumulative?
- Now this is clear in the text.

3 Anonymous Referee #3

Received and published: 25 April 2014

During the last decade terrestrial laser scanning has become a standard technology e.g. in civil engineering and is also a promising tool in erosion research. There are still several challenges such as shading, time resolution , and high-precision referencing of subsequent scans that makes purely methodological studies important too. However, the discussion paper in the present form remains below the state of the art and can therefore not be recommended for publication in HESS. The actual focus of the paper remains unclear, is it on methodology of terrestrial laser scanning in erosion research or does it target the specific erosion processes on black marls? In the first case the novelty of the study is limited and does not go beyond the existing literature. In the second case the experimental setup (aggressive irrigation of the soil (fig. 2), then complete drying out of the monolith with subsequent application of a moderately erosive rain not in reference to the natural environment of the soil) seems to be inadequate. Furthermore, the data analysis is not very ambitious. E.g. roughness estimations and their time dynamics could be an interesting aspect to be analyzed with the data.

Previous comment is still valid. In addition we think that the new version clarifies some of the above criticism. It is true that in general Laser scanning data needs still a lot of efforts to be fully exploited. We did a mistake by using the term "technical note", it is more a short paper than and a preliminary note, we have to change that. The title will be also changed to something like: "Preliminary results about micro scale slope mass movement in black marls", which will avoid the remarks. When the referee #3 indicates "below the standard", it is true if we were developing methods, but in that case we use standard methods (See Abellan et al., 2009). What we want to underline is the possibility to track phenomenon that have a great impact on erosion and infiltration.

We do not think that for the present study the roughness is important, because we want to show the observable processes,

Concerning the formal aspects, the linguistic quality is weak, the terminology has to be adapted to standards in erosion research. Table 1 does not really contribute to the understanding, at least column 1 could be omitted. Also figure 1 and 2 do not really contribute to the understanding, they could probably replaced by a schematic drawing of the experimental setup. Figure 4 is overloaded, axis tick mark captions are not readable, details of the shaded 2.5 dimensional visualizations cannot be identified.

We improved the language. The figure 1 has been simply removed, the second is kept and modified but the legend is improved. Figure 4 has been split in 4 figures.

Some specific doubts:

- What is "manual cleaning“, is it clipping out the area of interest or is it the identification and deletion of outliers due to hit raindrops or insects?

That is now explained

- Terrestrial laser scanning is time consuming, time resolution is therefore limited. What was the actual scanning time in relation to the investigated processes?

The scanning time was a few minutes, but such remarks are not relevant as the new devices are faster and faster and it depends on the manufacturer.

- Some of the comments could possibly help to find a base for resubmission of the paper with some data, that are worth to be analyzed.

We rewrote more than 50% of the paper…

- What is "creeping“, how was it quantified in fig. 4 and 5 ?

It is qualitative, and explained in the discussion

- What is shown in fig.3: Is it a crosshill or a downhill section of the DEM? What is the width where vector points are included around the section through the DEM? What was the reason to choose the specific smoothing parameters of the DEM?

We clarified those points in text

The dataset could principally be reanalyzed as a base for a resubmission of the paper.

We found that the updated interpretation no longer required a new analysis of the existing data.