

Response to RC2

Dear Reference

Thanks for your thoughtful comments and suggestions. We believe that they are helpful to further improve the clarity and quality of our manuscript. We are sure that your technical comments and suggestions are suitably addressed as follows.

Comment: I have tried to help with this, please see detailed comments and suggestions in the pdf attached as supplement. There are many comments and suggestions, but most of them are easy to solve.

Response: the author has revised the manuscript according to the comments and suggestions.

Comment: The authors mention correlations that are not included in the results, due to the fact that this is the core of the paper, they should include such type of relationships.

Reference list needs format corrections.

Response: 1) author has revised reference list to format corrections.

2) this manuscript use buffer belts analysis to reveal the corresponding relation between the change of cropland and the change of KRD around the settlements, and correlations among the KRD area and distribution, the quantity and distribution of cropland and settlement in the six study points are summarized as 3 scenarios of KRD forming processes:

- (1) The scenario of KRD with low land carrying capacity.
- (2) The scenario of KRD with moderate land carrying capacity.
- (3) The process of KRD with high land carrying capacity.

Comment: Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/se-2016-15/se-2016-15-RC2-supplement.pdf>

Response: the author revised this manuscript according to the supplement to this comment thoroughly.

Comment: Please explain in few words the meaning of peak cluster depressions here.

Response: a combination of clustered karst cones with a common base and depressions between cones.

Comment: Please consider if you can delete "in drylands" in this sentence, as your statement refers to the global scope of desertification, not only in drylands.

Response: Yes, it is deleted in this sentence.

Comment: Please add the reference here, close to the name. And use only the family name. If you have already used it, please excuse my ignorance regarding Chinese names...

Response: Thanks. this is modified.

Comment: same comment

Response: Thanks. this is modified.

Comment: This sentence has no sense to me. "Vegetation erosion" should not be used. I suggest: "Karst soil cover is degraded, vegetation eliminated and soil eroded. If this what you have in mind.

Response: this sentence has been modified as follows: it refers to the changing processes which transform a karst area that was covered by vegetation and soil into a rocky landscape almost devoid of soil and vegetation also (Yuan, 1997).

Comment: Please explain better what is the impact of settlement distance on KRD. It is not clear from you statement.

Response: this sentence has been modified as follows: and more than half of total KRD was dominated within the areas of 4 km from the rural settlement (Jiang et al., 2009).

Comment: Check spacing throughout the paper. There are several mistakes.

Response: this sentence has been modified as follows: The KDR phenomenon in karstic mountains in Southwest China, is the result of physical and human factor. The incentive of this phenomenon is the irrational human activity, the cropland per capita and the rural settlements.

Comment: Is this a question?, please clarify

Response: The reasons why farmers reclaimed overly sloping land induced severe KRD are attributed to the macro socio-economic circumstances of rural locality (Yan & Cai, 2015).

Comment: Please change the wording to "However, to date the formation and development of KRD has not been linked to cropland resources, settlement population and their related ecological impacts". I think that this is the meaning of your sentence.

Response: O.K., thanks a lot.

Comment: I'm not sure if the word "engage" is the best here. What about: maintain irrational activities?. Indeed, please consider if you can change this by "unsustainable land management practices"

Response: It is modified as : maintain unsustainable land management practices.

Comment: and experience the most serious KRD processes (Jiang et al., 2007)

Response: Yes, the author has modified it.

Comment: an incentive. Anyway I don't really agree with the adjective.

Response: Yes, the author has modified it.

Comment: Please change the wording of this sentence. I don't see how land productivity degradation can be the nature of something. Human disturbance and vegetation decline are both driving forces, even when vegetation decline can be a consequence of human disturbance.

Response: It has been modified as follows: A composite nature of degenerative condition is formed in this area where a fragile ecological environment is the basis, human disturbance is the strong driving force, the vegetation decline and land productivity degradation is the result.

Comment: ... why local farmers persist in unsustainable land management. "Irrational activities" can refer to very different kind of behaviours...

Response: the author revised it.

Comment: The authors should describe the objectives not results. Please change this sentence by:

"in order to unfold (or reveal, what you prefer) the mechanisms of KRD taking place in Karst mountains"

Response: it has been modified as follows:

So, the aim of the work is:

- 1) To understand the characteristic of flat cropland distributed at different karst topography and combined pattern.
- 2) To understand the relationship between farmland resources, settlement patterns and the mechanisms of KRD taking place in Karst mountains.

Comment: In this paper KRD classification criteria are referred in Table 1, based on ...

Response: Yes, the author modified it.

Comment: Please order the references according to the name of the main author or according to the dates, please check the format rules of this paper for that. And review the whole paper.

Response: Yes, the author modified it.

Comment: Please mention in the text the meaning of NKRD, LKRD, MKRD and SKRD, even if they are already explained in the table 1

Response: Yes, the author modified it.

Comment: Please use the same tense in the verbs

Response: Yes, the author modified it.

Comment: Please consider if the Table 1 can be used as a caption for the Figure 1. Even if this caption results long, it would be useful in order to integrate information.

Response: O.K., the author modified it.

Comment: I think that captions are independent from the text, therefore, you should inform about the meaning of any abbreviations in the figure in this caption. Consider the previous comment for that.

Response: O.K., the author modified it.

Comment: Please explain first the aim of this approach that considers the spatial distribution of plots/cropland patches.

Response: supplement: We consider to assess the land carrying capacity of six study sites according to the area and the spatial distribution of cropland patches.

Comment: what are the patch types?, according to size or according to use (cropland, grassland...). Please detail it here.

Response: cropland patch.

Comment: please clarify this sentence

Response: this sentence has been modified: different combinations of small terrain have different proportion of flatland terrain (referring to depressions in this paper) and form different area proportions of cropland resources.

Comment: "the flat cropland area is the lowest...", what do you mean with this sentence?. Do you refer to extension or to the position regarding m above sea level?

Response: this sentence has been modified: the flat cropland area is the least at the peak cluster-canyon,

Comment: It is difficult to understand what do the authors mean. Please ask for help to explain properly this paragraph.

Response: this sentence has been modified:

The area percentage of cropland at the peak cluster depression-valley combination increases to 10.74%, and this percentage at peak cluster depression surrounded by shallow hill area is the highest (Table 2).

Comment: It is difficult to understand what do the authors mean. Please ask for help to explain properly this paragraph.

Response: In terms of the percentage of cropland resources accounting to total area, 6 study points can be divided into three types, the continuous deep depressions, shallow depressions and peak cluster-canyon are shortage of cropland resources, open peak cluster-depression and peak cluster depression surrounded by shallow hill are rich in cropland resources comparatively, and peak cluster depression-valley is the transitional one between plenty and scanty cropland resources.

Comment: It is not clear. Is this column including the size of the largest plot found in the different land forms? . I think that an average and sD would be more representative.

I have the same doubt with the column of Least patch area

Response: Thanks. Yes, this column including the size of the largest cropland patch found in the different land forms. In table 2, we calculated the Largest patch area, Least patch area, at the same time, we also calculated the average patch area.

Comment: how has the aggregation index been calculated?

Response: In 2.2 Data sources and methods, the author has explained it: Aggregation refers to the tendency of patch types to be spatially aggregated, so, aggregation index of cropland patch was computed using FRAGSTATS4.2, For the definitions and full descriptions of these metrics, please see FRAGSTATS 4.2 user's guide.

Comment: The most frequent size of croplands range from the groups <0.1 and $0.1-1 \text{ hm}^2$

Response: Yes,the author has modified it.

Comment: This paragraph is difficult to read. I suggest a table here. In fact, if this information is included in Figure 3, there is no need to detail the information here. Just comment the most important facts.

Response: This paragraph is modified as follows: The number of croplands from $0.1-1 \text{ hm}^2$ to $1-5 \text{ hm}^2$ are 162 and 39, and their area account for 28.24% and 36.12% of the total cropland area

respectively, there are only 2 patches between 10-20 hm^2 accounting for 10.10% of the total cropland area in the continuous deep depressions. The cropland patches with sizes of 0.1-1 hm^2 are the most frequent at the shallow depressions areas in Dongtang. There are 37 patches of flat cropland, with a total area of 3.7 hm^2 and the largest patch area is up to 0.56 hm^2 in peak cluster-canyon combination. In the peak cluster-depressions surrounded by shallow hill, the cropland patches between 20-50 hm^2 account for 35.11% of the total cropland area. The cropland patches between 20-50 hm^2 account for 39.68 % of the total cropland area in the open peak cluster-depressions.

Comment: patches, having mainly 0.1 - 1 hm^2

Response: Yes,the author has modified it.

Comment: In my opinion, instead of numbers in the x axis, it would be better to see the area < 0.1 (instead of 1), 0.1-1 (instead of 2) etc. and add hm^2 as a unit in all the figures

Response: Yes,the author has modified it.

Comment: I see that the authors include the legend here. I insist, it would be better in the graphs.

Response: Yes,the author has modified it.

Comment: There are no correlations in the Table 4. If the authors have performed Pearson correlations or whatever, please include the data in the table or in the text.

Response: Yes, the author supplement it.

Comment: In my opinion "KRD land" is not properly written. it should be KR desertified land

Response: Yes, author has modified it.

Comment: how can this figure be explained?

Response: this area has a little of flat cropland, nearly all the cropland are sloping cropland. But there are many settlements and peoples, so, the ratio of settlement to cropland is very much high, it means the low land carrying capacity and high population pressure at this area.

Comment: Do you mean the use of sloping land for crops?, or reclamation of sloping areas.

Please clarify

Response: the use of sloping land for crops.

Comment: Again, are they reclaimed (restored) or they are used for crops. This is just an ambiguous word. try to use another one as suggested.

Response: being used for crops

Comment: Although some cropland aggregation effect exists, ...

Response: Yes, author has modified it.

Comment: In my opinion the authors cannot use "KRD landscape", as Karst Rocky Desertification landscape is meaningless. Please notice that KRD is a process. I suggest using "slightly desertified KR landscapes"

Response: Yes, author has modified it.

Comment: Not clear, please write this again.

If we define the ratio of cultivated land to the total area representing land bearing capacity and the ratio of settlement area to cultivated land area represents population pressure, the formation KRD in the peak cluster-depression areas can use the variations of these two ratios to clarify

Response: this sentence is modified as follows:

We use the percentage of flat cropland accounting the total area to represent land bearing capacity and the ratio of settlement area accounting cropland area to represent population pressure, the formation of KRD in the peak cluster-depression areas can be clarified according to the variations of these two indexes.

Comment: please add in the figure caption the meaning of NKRD, PKRD etc.

Response: Yes, author has modified it.

Comment: indices (plural), if I understand the sentence properly. In fact all these concepts: climate, vegetation, soils... are factors or elements, not exactly indices. Please clarify the meaning of this sentence.

Response: this is modified as follows: In Europe, five main quality indices such as climate, vegetation, soils, groundwater and socio-economic quality are used to estimate the sensitivity to land degradation and desertification (Symeonakis, et al.,2014),

Comment: Please clarify this sentence: climatic variability, in shaping today's land degradation has been understood also

Response: this sentence is modified as: Moreover, changing governance and transition towards new political and economic structures have been a key role in shaping today's land degradation in the context of climatic variability.

Comment: We find?. In this paper; Generally speaking?, the following referenced authors?, Please clarify.

Response: We find is revised as: Generally speaking

Comment: Again, please use land mismanagement or something similar. Irrational activities can have another meaning completely different from this.

Response: author has modified it.

Comment: settlements, cropland and KRD processes at peak cluster-depressions. Serious rocky...

Response: this sentence is modified as follows: The relationships of settlements, cropland and KRD processes at six different peak cluster-depression combination areas are compared, serious rocky desertification

Comment: If I'm not wring, I think that the authors mean that: low land carrying capacity is leading to the conversion of sloping land into croplands, and this is the main driving factor leading to KRD. Please check if this is the meaning and change the sentence accordingly

Response: Yes, the author revised it.

Comment: help to re-discover. But, why re-discover?, Was it discovered previously?, please add a reference. If you mean revisit, please change the wording.

Response: re-discover is modified as : reveal.

Comment: abandonment?

Response: Yes. The author revised it.

Comment: Why including mining activities just in this stage?, I suggest to delete it.

Response: Yes.

Comment: Really difficult to understand. I strongly recommend that the authors ask for help at least to write the conclusions.

Response: the conclusion is revised as follows:

The current studies do not discuss the KRD's occurrence and development from the perspective of cropland, settlement population and its corresponding ecological impact. This paper works from the assumptions about KRD in peak cluster-depression based on previous studies, and selects six typical peak cluster depression areas in Guizhou Province to conduct case studies for this theoretical assumption. Some views have been concluded as follows:

- (1) The KRD area and distribution is related to the quantity and distribution of cropland and settlement in the six study points, KRD is a kind of response of this interaction relationship between human (settlement)-environment (cropland).
- (2) SKRD only happened in areas with low land carrying capacity and big population pressure.
- (3) The characteristics of KRD are: 1) population pressure exceeds land carrying capacity; 2) lack of arable depression resources makes slope land arable; 3) low land carrying capacity is the root cause of Karst rocky desertification.