Comments to the Author:

The paper "The hidden ecological resource of andic soils in mountain ecosystems: evidences from Italy" has an interesting way to look upon Andic soils and provide new insight in the Italian non volcanic mountain environments. It can be seen as a promising step forward in this field.

The presented manuscript is within the scope of the SE and represents a good contribution to the scientific progress. Novel data and ideas with known tools and concepts are used to provide new insight in the field. The quality and presentation of the scientific results is fair.

The methods and assumption are partly valid and not always clearly outlined. A reproduction by fellow scientist might be difficult as well as the traceability of results, due to the lack of presented data.

The authors do not give proper credit to mentioned methods, as several references seem to be missing. A differentiation of new/original contribution to literature data could be strongly improved, as not all data is transparently provided.

Nevertheless the title clearly reflects the content of the paper. The abstract is fairly concise. The overall presentation is still poor in structure, although version 2 is a clear improvement to version 1. The language is fluent, but in certain parts neither precise nor grammatically correct. Abbreviation, symbols etc. are mostly defined correctly.

Suggesting for certain parts of the paper, which should be clarified and reworked, are provided accordingly on the following pages of this review. The number of references could be improved, as stated in the reference section.

Overall, the second version of the manuscript is a great improvement to the original version 1. Nevertheless, the manuscript is still in need of further refining. Here are some main suggestions:

• Several sentence structures should be shorten to improve readability.
• A thorough grammar correction of the entire manuscript is needed and a re-evaluation of certain wordings.
• The presented manuscript lacks throughout several section on precision and transparency regarding data and methods. It is often unclear why data is spared or used for a certain purpose, or data that is used and not provided in the manuscript in full.
• Therefore it is strongly advised to refine the manuscript. Adding missing explanations together with a comprehensible reasoning of certain steps to provide a more transparent and clearer picture of the study.
• Furthermore, additional references for certain themes (especially within the method and discussion section) should be added.
• Tables and figures should be meticulously corrected, as they do not reflect identical data. A distinguishing between new and literature data is besides a mentioning in section 2.2, not given, and has to be improved.

Detailed suggestions of specific comments and technical corrections (typing errors etc.) are market with **"page# / line#"** in respect to manuscript **version 2.**

1 / 17: Suggestion, dot after "time". New sentence starting: This feature/unique capability is especially…

1 / 18: Specify "these". e.g. delete "these" and write "andic"

1 / 19-22: sentence with 41 words should be cut in half, to improve the readability.

2 / 2: What is really define as low slope in this study? 12° or 30°, as later on page 6 line 12 written? Please clarify the used parameters

3 / 2: Please do a thorough grammar correction of the manuscript for quality reasons e.g. "an unique" not "a unique"

3 / 3: As state before, please do a sincere grammar correction e.g. delete "soil" in front of morphological and put it before properties

3/3 : Please be precise with the wording e.g. instead of "Between" use "Among or The main characteristics are.."

3 / 6-12: To improve readability, please split this sentence.

3 / 17: a single "artefact" or multiple "artefacts" ?. Also a new sentence could be started here. As a sentence with >50 words seem a bit long (line 12-18) for most readers.

3/ 22: it would be helpful for readers to write the countries and regions where the according authors (as done at 12/6-10) have found volcanic landscapes in non-volcanic mountain ecosystems, as „throughout the world" is very general. This would also emphasis the impact/importance of this research. Please state why Italy was chosen as study object, and not any of those other "around the world"?

4/1-3: Please provide clearer information about the C storage capacity. It is stated that andic soils have important C storage abilities. Which ones? How much more or longer can they store it? Why kind of soils so special?

4/20: Please clarify parameter for "low slope", 12° or 30° as later on page 6 line 12 written?

5/3: instead of ":" a dot would be sufficient

5/13: In the introduction it is explained that NVME are found around the world. Why is the focus than on Italy? Maybe start with the necessary features and narrow it than down to the best fitting location, which seems to be Italy in this case. Please provide references of the provided information within the section "study site".

5/13: Very well that there is now a map added, compared to version 1.

6/8: how was the sampling carried out. What material was used to do the sampling? An additional table including all sampling sites, with their slopes, soil type, horizon depth, elevation etc. would improve the transparency that each chosen location fulfilled the designed requirements. This is not the case yet, as only average values are presented.

6/10: Please clarify parameters. >600m or >700m as stated previously (page 2, line 1)

6/12: As mentioned early, please clarify e.g. 30° or 12°

6/18: please explain briefly the methodology. As the work in this study is with 28 samples mainly based on data of the paper "Iamarino and Terribile, 2008". It is suggested that key data, which were used for this evaluation should be presented in a referenced table.

6/21: Please do a grammar check, preposition is missing after "...and 5 soils…"

page 5-6: The clearer separation of the soil sampling and the computational part is an improvement to version 1.

7/13-24: A good, logic and clear-presented paragraph, that emphasis in detail „why", „what" was chosen, in a very transparent way. Please adapt this style to key point of the manuscript (e.g why Italy, or a certain method...). A small table could provide a better overview of the respective characteristics of each year (7/19-24) instead of bullet-points.

8/11: Please check grammar e.g. "All statistical analyses were performed…" Reference is needed to the ANOVA (Tamhane method).

8/15: "collected form all soil horizons". How many were there? Where is the supporting data and detailed portrayal of the soils?

8/16: Which are the main horizons? in 4.2 page 12 line 18 it is written A and B. What makes those two the main horizons?

Page 8/- Methods: In general are only few citation given in comparison of the many treatments/methods used e.g. Walkley & Black method, Tamhane method, Schwertmann method, Blakemore method. Please add the missing references.

8/7: When is a class defined as predominant and not exclusive? What is the threshold value? The same goes for continuous and discontinuous natural grassland. When to call which which?

8/15: how were those bulk soil samples collected? shuffle, soil corer, same 200cm3 cylinder?

8/18: What was the air temperature? How long were the samples dried them? Please add additional information and add precision to the method section and writing e.g. "The 2 mm fraction was used for further analyses." There should be no room for interpretation of how it was care bout and what was carried out.

8/19: please add literature reference to the "Walkley & Black method". Why was not a modern C/H/N measurement carried out?

8/21: Please add literature reference to the "Schwertmann method". Please add instrument specifications of the ICP-AES instrument. Please provide the full results of the measurements with the according standard error.

8/23: Very good that the Alox + ½ Feox, and the P retention were obtained. Please check again the WRB, are those really andic features? Please use the according WRB soil taxonomy. Provide a detailed soil description, at least of the horizon of interest. This includes (eventual the Munsell colours and) clear differential of andic and vitric.

8/24: please add literature reference to oxalate method (I think Mizota and van Reeuwijk, (1989)) and the "Blakemore method".

9/ 7: Please add an article "the" to the word "use" or change to "using".

9/15 : the stated formula should have also been created with a formula editor, having the number (2).

10/9: Very good for providing a better consistency with the WRB classification compared to version 1 (9/9 year 2006, 8/7 year 2014). Please ensure that truly the right classification is used for all interpretations. Just changing the year numbering is not sufficient. Furthermore, please add the according year, to all WRB references in text, tables and figures.

10/12: What does a high and low Alo+0.5Feo% exactly say about the ordering? Figure 2 has it graphically explained, but a written explanation would be advisable. Use a similar writing style as in 7/13. Please, also add references in regard to the relation of this value and clay mineral ordering.

10 / 8-13. Suggesting to split the sentence into 2. Second sentence could start in line 10 with "Most interestingly…"

10/14: Above it is stated that 28+7 soils were investigated. How are those referred 42 pedons important? How do those mention 42 pedons connect with the 35 investigated once? Please add additional geographic information and explain "these pedons". Could be added to the sampling map. "horizon-based means" of what kind?

10/18: "dataset shows". There is not any full data set shows. There is only an essence of diverse datasets present in table 1.

10 / 22: What are the other "land uses"? Please specify.

11/1-4: Please re-arrange commas or restructure sentence.

11/7: Minor remark, delete space between "that" and the "comma".

11/8: … wetter year 2014? Please remind the reader what conditions defer 2003-2005 and 2014.

11/16-17. I suggest shortening the sentence into 3. e.g. ...the main features of the studied soils are reported. The soil… … Moreover…

11/18: be careful with andic features. For the result section it is stated the WRB of 2006 in version 1. Now it is WRB of 2015. The diagnostic properties for andic soils of WRB 2006 would be Alox + 1/2 Feox of >2%, <0.9kg dm-3, P retention >85% and organic C of < 25%. Furthermore it would be sub-classified to sil-andic and alu-andic for certain values. In comparison to vitric, which would have an Alox + 1/2 Feox of >0,4% and a P retention of >25% etc. Please re-check the data, if it still fulfills the according requirement of the used year 2015, and add accuracy to this section.

11/18-19: Please provide the exact the P retention percentages. In table 2 retention values are provided, how does the reader know which % expresses which range, moderate or high? What does „high" mean? 85%, 90%, 66%.?

11/24: Maybe the findings with the used cover classes (Beech, Oak, Chestnut, Grassland) have shown, that there is no correlation / or non, could be found, but this is not in general the case. Recent finding e.g. the sampling strategy by Raab et al. (2017) clearly reads "ferns were used as bioindicators, as they are primarily found on acidic substrates, which is a common feature for volcanic soils." Therefore, if a vegetation cover is investigated, it should be considered that certain plants actual prefer an environment created by Andosols anyway. Are the used cover classes actual in favor of acidic soils? Would the vegetation even have the pre-requirement to even be considered to be used as correlating factor?

It could also simply just be re-phrase to "the investigated vegetation covers seem to be of little importance in determining…". Be careful with the wording "andic" as it requires clear parameters. Parameters, which cannot be seen, as there is no table that provides the according data.

12/8: Citation: Dumig or Dümig?

12/6-10. This is introduction information, which would fit very well at 3/22.

12/18: What are the selection criterias?

13/-: Please explain why only 16 data points were chosen for Fig.3., and how they were selected. Are those just A horizons of Table 3. If so, why?

The discussion reads more fluently compared to version 1. A refining of the key points that have to be emphasized would be welcomed. As well as a increase of precision and clarification of certain steps (e.g. why only 16 data points, high/low P retention etc). A grammar correction is still needed, as there are several sentences with wrong sentence structure (e.g. 14/15), missing articles (e.g. 14/16) etc. Please reinforce and emphasizes better what is different and what is similar from you're your work to the work of others. There still long paragraphs without references.

14/15: This key point is very well emphasized! Also previous arguing (/14/6-12) is very concise and clear!

14/9-10: The affect of land management is mentioned. Please provide in the tables what is/was the land use of the investigated soils and study areas.

15/6-11: A splitting of the sentence in two is recommended.

15/16-17: Please see comment 17/4. Looking at Table 2, it is seen that the Phaeozems have the highest value of organic C as also written on page 11 line 20-21. This should not be neglected. Furhther named soils which are do not show any values in any tables of this study should have at least an referenced value provided e.g. Regosols (___), Podzols (____)

16/4-5: "known to be easily erodible", by whom? Please add reference. Check the WRB criteria for "andic".

16/22: Which WRB?, Which Soil Taxonomy? Please add references.

17/4: C-storage and C-residence time are often mentioned (abstract, introduction, discussion, conclusions). Could accurate numbers be provided about it? Suggesting to provide the audience absolut numbers in the introduction ,page 3 line 7,from Post, 1983; 7 Batjes, 1996; Amundson, 2001.

References

Use same formatting for all references. Either shorten all forenames or non. e.g. Chen Yao or Dixon, R.K., —> follow SE guidelines.
Terribile, 2006 is missing in the reference list.
Cecchini, 2002 is in the reference list, but not used in the manuscript.
APAT is confusing as "CORINE land cover" is used in the text.

To ensure a bright diversity of scientific content it is important that a good mix of different sources is present in the paper. Looking through the reference list the following has been found:

Total reference#: 59
Corr. of missing: -2 +1
New number: 58

# of times named as Author / Co-author / Total / %
Terribile: 2 / 5 / 7 / 12%
Iamarino: 2 / 1 / 3 / 5 %
Langella: 0 / 0 / 0 / 0%
Manna: 0 / 0 / 0 / 0%
Mileti: 0 / 1 / 1 / 2%
Vingiani: 2 / 1 / 3 / 5%
Basile: 3 / 2 / 5 / 8%
Cross overlapping sum: 9 / 10 / 19 / 33%

Without any overlaps as (co-)author, 8+1 paper of the authors are citied, equals in an amount of about 16% of self-citation. I just want to provide these numbers for transparency reasons. As there are still numerous references of the method section still missing (as suggested to be added) I am very confident that this 16% will decrease drastically.

Figure captions:

Fig.1. What kind of map is that and what is the source of it? Please provide references.

Fig.2. Which WRB classification has been used? Mentioned in the text, but not at the figure caption.

Fig.3. Explain the differences of data points and sampling numbers in the text. Using just a selective number of data points, without reasoning in the text does not represent a scientific approach.

Fig.4. The weight mean Alo and Fe according to horizon thickness is used. It would be useful show also the horizon thickness of each pedon in a table, to make the results reproducible to other.

Figures

Fig.1. The map is definitely an improvement to version 1, where it was missing. Nevertheless, the color, and size of the marking points has to be reconsidered, as those are poorly readable. Also a geodetic system (e.g. WGS84), elevation scale, and a metric scale would improve the figure.

On page 6, line 17-20 it is written that were investigated 28 +7 soils= 35. On the map I have found only 28 triangles. Missing data points have to be added for transparency, as well as a legend, that makes it possible to differentiate the numerous sources. Further it is advised that the used classification of Fig.2: Umbrisol, Phaeozem, Cambisole and Andosol is added to see the distribution, using different markings and colors.

I am surprised that the Sila massif in Calabria has not been used in the study. Especially as F. Scarciglia (2008) is cited in the introduction. Scarciglia et al. (2008) wrote clearly about the volcanic soil formation in Calabria as well as the co-author Vingiani (2014). Please elaborate why the Sila massif was excluded in the study, as it clearly fulfills the NVME with an average elevation of 1300 m as (previous criteria >700 m) and low slope gradients?

Fig.2. What does each bar represent? I counted 36 bars, compared to the stated 35 samples (28+7, page 6 , line 17-20), therefore I assume each bar represents one investigation site. But, where does the Umbrisol bar come from? There is no reference made in the figure captions, nor in the graphic. Furthermore, as a reader it is not transparent which bar represent which sampling site market on the map (figure 1). Therefore it is not possible to identify which location shows which features and characteristics. A geographical reference to the presented data would improve the informational value for the reader.

Fig.3. Please explain why only 16 values are plotted. Based on Table 3 I assume that only the values of the A horizons are plotted. If so, please add this information and explain also why. Why were the B horizon values not plotted? Only 13 Andosols are presented in figure 2. Also in the manuscript text it is not clarified why only 16 values where chosen of a dataset with a sample size of 35.

Fig.4. Good overview of the data, although hard to read. An increase of the font size and symbol size is suggested, as there is still enough space in-between the individual graphics. Please explain also why there are only 8 Grassland land-covers shown in Table 1 and Table 2, but 9 points plotted for Grassland within all the selected years (2003,2005,2014).

Tables

Table1: Lack of detail information which of the soils comes from which data source. In section "2.2 Soil sampling" (page 6) several different sources are explained. Why is the data not displayed in groups containing all data and their according sources to have a full transparency? The average values can than be displayed on the bottom of each group. If a more comprehensive table is provided, it should also include the full coordinates of each investigate soil.

Table 2: Same poverty of displaying used data as in Table 1. Please create a more comprehensive, and even more importantly, transparent table. The shown table makes it difficult to reproduce the steps, nor are newly measured soil values accessible to the community. Why is only the A horizon mode displayed, although in section "4.2 Andic features and soil hydrology" (page 12) it is stated that "… a selection of .. .form horizon A and B of…"?

Please label the percentage sign (above the values 37, 69…) so readers know what the numbers actual represent. Please add to the supporting information of the table how the organic C, Alo+05Feo and P retention was evaluated (method name). What was the depth of the horizon? This is key information, as weighted values were created based on the horizon thickness.

Table 3. Here the horizons A and B are presented. It is absolutely unclear why a certain number of soils are selected for each horizon, nor are the individual values visible. Please clarify and provide a better transparency.

Table 4: Small graphic error of the line formatting (dotted line instead of straight line=), below first years row. Please add a reason why certain values are bold and others are not, so they audience understands their importance.

I hope the stated suggestions are useful, helpful and improve the quality of this manuscript. I did my very best to act as objectively as possible for the benefit of science.