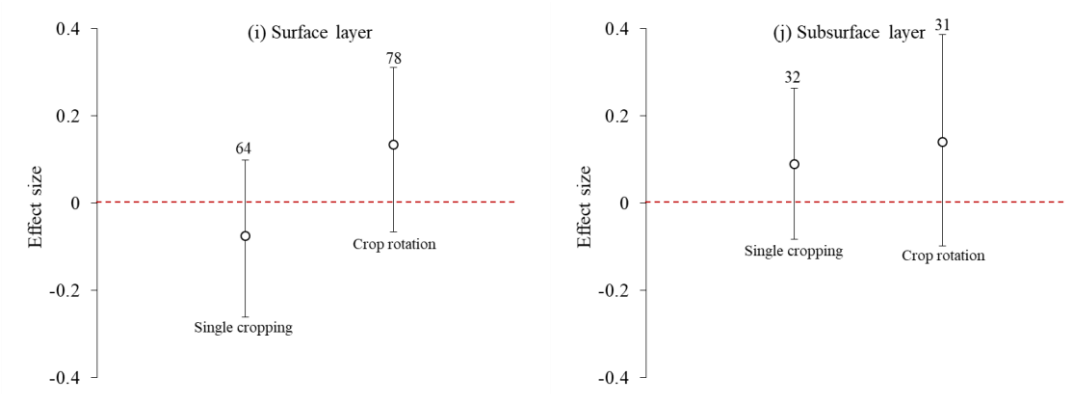
Response to RC1

1. I think that the paper is in general well written. However, I have some serious concerns about the election of factors that you relate with Ksat. Mean annual temperature does not affect Ksat, neither elevation does. The fact that you find a correlation between Ksat and MAT does not mean that mean annual temperature affects Ksat. It is probably a spurious correlation. You can say that Ksat and MAT were statistically correlated, but it does not mean that MAT controls Ksat. Otherwise, you should find and mention in the introduction several studies finding the same relation. You should select the factors to correlate with Ksat based on previous studies (in the introduction section there are not references relating Ksat to temperature nor to elevation for example). Probably, grouping the data in clusters could be helpful as well. There are several factors that were found to correlate with Ksat that were not considered as clay type, soil parent material, crop rotation, etc. This is a problem.

Answer: Thank you for your suggestions. In the revised manuscript, we have indicated that climatic and topographic factors mainly indirectly control K_{sat} responses via other variables (e.g., soil moisture, biological processes and effective porosity) (Jarvis et al., 2013).

In the introduction section, we have specified that climatic and topographic factors were found to be related to K_{sat}. For instance, Jarvis et al. (2013) proposed that climatic factors can affect K_{sat} through the effects of soil moisture on soil biota and plant growth and thus the abundance of root and faunal biopores; Yang et al. (2018) found that elevation and soil properties dominated K_{sat} spatial distribution in the Loess Plateau of China.

In the revised paper, K_{sat} of surface and subsurface soil layers was not analyzed together (Figs. 3 and 4). In addition, we also investigated the influence of cropping system management (single cropping and crop rotation) on the effect of tillage conversion on K_{sat} (as shown in the figure below). It is found that cropping system management did not have a significant influence on the tillage effect on K_{sat}.



We did not investigate the influences of soil parent material and clay type on the effect of tillage conversion on K_{sat}, which is attributed to the fact that few literatures provided this information. In addition, we have considered the soil texture type, which is a function of the parent materials and clay type.

2. The title does not reflect the content of the manuscript. Authors should mention that it is a meta analysis on correlation between Ksat and environmental factors, including data obtained with different methodologies.

Answer: Sorry for this confusion. The title has been changed to “Effects of conversion from conventional tillage to conservation tillage on saturated soil hydraulic conductivity obtained with different methodologies: A global meta-analysis”.

3. P4L71: Texture is not affected by tillage. Please rewrite.

Answer: Sorry for this confusion. “texture” has been replaced by “organic matter content”.

4. P5L95: Even when a global analysis maybe is not yet available, there are several studies relating Ksat response to tillage and environmental conditions. Then you need to rewrite this sentence and cite these studies. For example:

https://doi.org/10.1016/j.geoderma.2013.04.015

https://doi.org/10.1016/j.still.2008.01.007

Answer: Thank you for your suggestions. In the revised paper, we have indicated

that previous studies have related the response of K_{sat} to tillage and environmental conditions (Strudley et al., 2008; Bodner et al., 2013). However, there has not yet been a global synthetic analysis specifically focusing on how environmental conditions could affect the tillage effect on K_{sat}.

References:

Bodner, G., Scholl, P., Loiskandl, W., and Kaul, H.-P.: Environmental and management influences on temporal variability of near saturated soil hydraulic properties, Geoderma, 204-205, 120–129, https://doi.org/10.1016/j.geoderma.2013.04.015, 2013.

Strudley, M. W., Green, T. R., and Ascough II, J. C.: Tillage effects on soil hydraulic properties in space and time: State of the science, Soil Till. Res., 99, 4–48, https://doi.org/10.1016/j.still.2008.01.007, 2008.

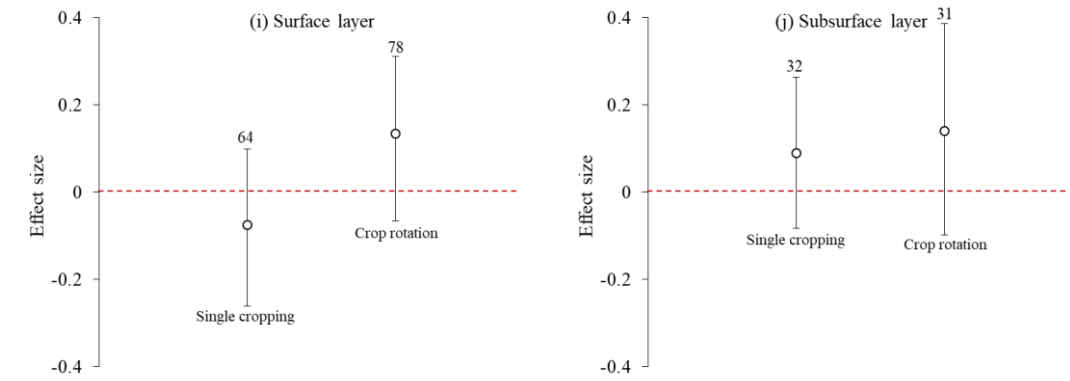
5. P6L106: Mean annual temperature and elevation are not factors influencing directly Ksat. Furthermore these factors were not justified in the introduction. Ksat of different soil layers can not be analyzed together. Furthermore, there are important factors as soil type, clay composition, crop rotation, that are very important in the response to different tillage systems.

Answer: Thank you for your suggestions. In the revised manuscript, we have indicated that climatic and topographic factors mainly indirectly control K_{sat} responses via other variables (e.g., soil moisture, biological processes and effective porosity) (Jarvis et al., 2013).

In the introduction section, we have specified that climatic and topographic factors were found to be related to K_{sat}. For instance, Jarvis et al. (2013) proposed that climatic factors can affect K_{sat} through the effects of soil moisture on soil biota and plant growth and thus the abundance of root and faunal biopores; Yang et al. (2018) found that elevation and soil properties dominated K_{sat} spatial distribution in the Loess

Plateau of China.

In the revised paper, K_{sat} of surface and subsurface soil layers was not analyzed together (Figs. 3 and 4). In addition, we also investigated the influence of cropping system management (single cropping and crop rotation) on the effect of tillage conversion on K_{sat} (as shown in the figure below). It is found that cropping system management did not have a significant influence on the tillage effect on K_{sat}.



We did not investigate the influences of soil parent material and clay type on the effect of tillage conversion on K_{sat}, which is attributed to the fact that few literatures provided this information. In addition, we have considered the soil texture type, which is a function of the parent materials and clay type.

6. P8L149: This value is arbitrary of was calculated from the rest of the studies? Usually Ksat can show coefficient of variation higher than 0.5 (50 %) and sometimes higher than 100 %. Please justify the election of this value

Answer: Sorry for this confusion. This value is selected because it was suggested by a reviewer before. However, we don't really agree with him/her. Because the coefficient of variation here does not refer to the spatial variation of saturated hydraulic conductivity, but is calculated for repeated samples. Therefore, according to most previous studies, if the SD value is not given in the original text, it is generally 0.1 times the mean value by default.

For example:

Li, Y., Li, Z., Cui, S., Jagadamma, S., and Zhang, Q.: Residue retention and minimum tillage improve physical environment of the soil in croplands: A global

meta-analysis, Soil Till. Res., 194, 104292, https://doi.org/10.1016/j.still.2019.06.009, 2019.

2.2. Data analysis

Data were analyzed by calculating the natural logarithm of the response ratio (ln*RR*) for each soil property index to compare treatment means (-NT, RT, NTS, RTS, or CTS) with the control means (-CT) (Osenberg et al. (1999); Li et al. (2018). The variance (v) of the ln*RR* was calculated using the equation, $v = S_t^2/n_t \times X_t^2 + S_c^2/n_c \times X_c^2$, where S_t and S_c represent the standard deviations of the treatment and control groups, respectively; and where n_t and n_c represent the number of replicates for the treatment and the control groups, respectively. For studies that did not report SD or SE, SD was estimated as 0.1 times the mean (Luo et al., 2006). To derive the overall response effect of the treatment group compared to the control group, the weighted response ratio (RR_{++}, also defined as effect size) between the treatment and control groups was calculated according to Hedges et al. (1999); Luo et al. (2006), as described in Equation (1):

$$RR_{++} = \frac{\sum_{i=1}^{m}\sum_{j=1}^{k} w_{ij} RR_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{k} w_{ij}} \quad (1)$$

In addition, we also studied the influence of SD value (0.1, 0.2, 0.4 and 1 times the mean) on the meta-analysis results, and found that it is not significant.

Therefore, in the revised paper, we still select 0.1 times the mean as the standard deviation.

7. P11L218: Please see my observation in the figure. The linear regression does not seem to be a good election for the data.

Answer: Indeed, the accuracy of quadratic polynomial fitting is higher than that of linear regression. In the revised manuscript, we have indicated that the relationships between the ln(R) of K_{sat} and MAT, MAP, and elevation can be well fitted by quadratic polynomials, with the R^2 values ranging between 0.064 and 0.585 (Fig. 4).

8. P12L234-235: In the Discussion section it is important to mention that since studies comparing CS vs CT effects on Ksat using different methods are from different places, maybe there are other reasons that explain the differences found. For example if studies from Argentinean pampas region do not include some methodologies, maybe in those soils the results are not only affected by the

methodology, temperature and precipitation, but also by the clay type or other factors. Some cold weather soils present freezing-thawing processes that are important for pore generation. And so on. Please mention all these possible reasons for the results.

Answer: Thank you for your suggestion. In the revised manuscript, we have indicated that since studies comparing tillage conversion effects on K_{sat} using different methodologies are from different places, maybe there are other reasons that explain the differences found. For example, the study of Lozano et al. (2016) from Argentinean pampas region did not include ring infiltrometer, hood infiltrometer and rainfall simulator, maybe in those soils the results are not only affected by the measurement technique, MAT and MAP, but also by the clay type or other factors. Some cold weather soils present freezing-thawing processes that are important for pore generation.

9. Conclusions: These conclusions are more results than real conclusions. It would be better if you write an explicit hypothesis (at the end of the introduction section). Then the conclusions will be an answer to the hypothesis.

Answer: Thank you for your suggestion. At the end of the introduction section, we specifically hypothesized that conversion to CS can increase the soil K_{sat} measured by ring infiltrometer and rainfall simulator. In the conclusions section, we have indicated that the effect of tillage conversion on K_{sat} was related to experimental conditions, especially the measurement technique, conversion period and climatic and topographic factors. The increase of K_{sat} measured by single- or double-ring infiltrometer and rainfall simulator was substantially larger than the other techniques.

10. P15L315: This reference is not cited in the manuscript. Remove

Answer: Sorry for this confusion. This reference has been removed in the revised manuscript.

11. P16L335: This reference is not cited in the manuscript. Remove

Answer: Sorry for this confusion. This reference has been removed in the revised

manuscript.

12. P18L366: This reference is not cited in the manuscript. Remove

Answer: Sorry for this confusion. This reference has been removed in the revised manuscript.

13. P20L416: This reference is not cited in the manuscript. Remove

Answer: Sorry for this confusion. This reference has been removed in the revised manuscript.

14. Figure 3: The relationship between ln R and MAT does not seem to be linear. The residuals of the regression should be independent and present homoscedasticity. Maybe another function adjust better.

Answer: Thank you very much for you suggestion. Indeed, the accuracy of quadratic polynomial fitting is higher than that of linear regression. In the revised manuscript, we have indicated that the relationships between the ln(R) of K_{sat} and MAT, MAP, and elevation can be well fitted by quadratic polynomials, with the R^2 values ranging between 0.064 and 0.585 (Fig. 4).